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A SYSTEM
OF
MIDWIFERY,

INCLUDING THE
DISEASES OF PREGNANCY AND THE PUERPERAL STATE.

BY
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OBSTETRICAL SOCIETY OF EDINBURGH, AND OF THE
OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY
OF BERLIN, ETC., ETC., ETC.**

WITH ONE HUNDRED AND EIGHTY-TWO ILLUSTRATIONS.

PHILADELPHIA:
HENRY C. LEA.
1873.

SHERMAN & CO., PRINTERS, PHILADELPHIA.

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V124
L53
1873
Am. 2d

P R E F A C E.

THE Author's object in this work has been to furnish to Students and Practitioners a Complete System of the Midwifery of the present day. Its claim to a title so ambitious may be questioned.

Of English Text-Books, some of the very best have long been out of print; some are out of date; and others are mere Handbooks, in which the subject is, however ably, but cursorily treated. In our language, scarcely a modern work exists which can be compared with those of Cazeaux and Scanzoni. This is the Author's apology for an attempt in which, while he does not presume to emulate those authors, he ventures to hope that the fruit of some earnest labor, but too scant leisure, may not be held unworthy of consideration.

There are, he believes, few modern works of approved merit, whether British or Foreign, with which the Author has not made himself familiar; nor has he scrupled to avail himself from these sources, of what seemed to him, at any point, to contribute to the elucidation of the subject. In no case, it is hoped, has this been done without ample acknowledgment.

The meagreness of statistical details, references, and illustrative cases, is a part of the original plan, adopted with the view, as far as the subject will admit, of maintaining the narrative form.

To several of his colleagues, to many professional friends, and, especially, to Dr. Gavin P. Tennent for assistance in passing the work through the press, the Author is under obligations which he cannot too warmly acknowledge.

4 MONTAGUE PLACE, GLASGOW,

July 1st, 1873.

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A SYSTEM OF MIDWIFERY.

CHAPTER I.

INTRODUCTORY.

HISTORY OF MIDWIFERY—HIPPOCRATIC ERA—ARABIAN SCHOOL—AMBROISE PARÉ—MAURICEAU—ENGLISH MIDWIFERY—OBJECTIONS TO THE PRACTICE OF MIDWIFERY CONSIDERED—COMPARATIVE ANATOMY OF THE PELVIS—THE PELVIS AS A TUBE THROUGH WHICH THE PRODUCT OF CONCEPTION PASSES—PARTURITION IN THE PRIMATES: IN THE VARIOUS RACES—THE ERRECT POSTURE THE MAIN CAUSE OF COMPARATIVE DIFFICULTY IN THE HUMAN SPECIES—THE HUMAN PELVIS A CURVED CANAL—SEPARATION OF PELVIC ARTICULATIONS DURING LABOR—MIDWIFERY DEFINED.

THE History of Midwifery is to the student of that art a subject not only interesting, but also in some degree instructive. To trace from their earliest development, whether in the crude ideas of ancient times, or in the hasty generalizations of an epoch not far distant from our own, the growth and maturity of the theories which we now believe to be in accordance with the truth, is indeed in itself an attractive pursuit; and the student has his reward in the thorough mastery which he thus obtains over details, which can scarcely be effected by the mere dogmatism of ordinary teaching.

For various and evident reasons, however, the history of the obstetric art cannot be embraced fittingly within the limits which must be fixed for matter purely introductory to the study of a great practical subject. Not even in outline, then, will a consecutive history of Midwifery be attempted; but, as reference will in the sequel be not unfrequently made to the doctrines and practice of the past, a few sentences may here be devoted to the consideration of the midwifery of certain epochs, in view of the influence which these may be supposed to exercise on the practice of the present day.

From the earliest records, more or less authentic, which seem to throw light upon the subject, it would appear that the practice of Midwifery was in the first ages entirely in the hands of women. If we may judge, however, from the fact that a law was passed in Athens, at a very early period, by which women were absolutely prohibited from

motions and leaping of the child (supposed, even in comparatively modern times, to contribute greatly to its delivery) was thereby interfered with. Many other points of interest and of practical importance are referred to by him, one or two of which may be noticed. We have here, for example, in a chapter, "*De Fœtûs Extractione ac Exsectione*," which he takes from Philumenus, the first indication of the speculum vaginæ, in an instrument which he recommends for the purpose of separating the external parts, in order to bring the cause of obstruction into view. We have also a perfect description of the crotchet (*uncinus attractorius*); and in his description of a method of delivery by the application of two crotchets,—one to each side of the head,—we cannot fail to observe that the mechanical principle of the midwifery forceps was not only then adopted in practice, but was thoroughly understood by the author, and brought him very near to the discovery of the forceps of modern times. And finally, we have here the operation of turning in cases of difficult cranial presentation recommended, in terms which place it beyond a doubt that the procedure indicated is in all respects identical with what of late years has been introduced in similar cases, as a novelty and an improvement in modern practice. The credit of the discovery and demonstration of the Fallopian tubes was claimed by Galen, but there is no doubt that they were described at a still earlier period than the epoch now in question by Rufus Ephesus, who lived in the reign of Trajan (*circa* A.D. 110). The last writer on this subject of the old Greek school was Paulus Ægineta, to whose works little originality can be attributed.

The favor in which literature and the sciences were held by the Arabs evidently exercised a most beneficial influence in the development of the Arabian school of midwifery. The name of Rhazes, a physician of Bagdad towards the end of the ninth century, is associated with the discovery of the fillet. About a hundred years later a very remarkable and voluminous series of works on midwifery and allied subjects was given to the world by Avicenna, a physician of Ispahan. His works consist for the most part in a confirmation of the leading views of the Greek school, and as they enjoyed an extraordinary popularity in Europe, as well as in Asia, it was by this channel mainly that the errors of the ancients were diffused throughout the world. The fundamental error of Hippocrates he adopts in a modified degree. All presentations, says he, save the head, are preternatural: the head ought, therefore, to be reduced, in all such cases, into the natural position, but, should this be impracticable, we may deliver by the feet. He recommends in certain cases the use of the fillet, which when used for extraction, is to be fixed over the head; and, should this fail, *the forceps* is to be applied to the head and extraction then attempted, while as a last resource only are the perforator and crotchet to be employed.¹ A reference to this passage makes it perfectly clear that the instrument alluded to is essentially the midwifery forceps; while the fact that the author nowhere describes the instrument as a novelty, warrants us in the belief, that about the tenth century, or possibly at an earlier period, the use

¹ See the chapter, "*De regimine ejus, cujus partus fit difficilis causâ magnitudinis fœtûs*."

head in breech presentation had, up to this period, been all but universally adopted in European practice, even although that error had been to a great extent corrected by the later Greek and the Arabian writers. It is not, then, too much to assert, as we have done, that the blunder of Hippocrates, so frequently alluded to, was the practice for little less than 2000 years after his death.

In this collection, however, there is one work which we must mention with more respect,—that of the illustrious Ambroise Paré,—of whom Smellie says no more than is his due when he terms him “the famous restorer and improver of Midwifery.” The revival of anatomical study under Vesalius, and the numerous dissections which had been made of pregnant women by him and by his follower Columbus, had already corrected many of the anatomical and physiological errors, which, being time-honored, were therefore considered to be respectable, and were generally admitted to be true. The belief in these doctrines being thus sapped by the logic of facts, the whole rotten superstructure began to crumble away, and from this epoch modern midwifery may be said to have had its origin. It required a mind of no ordinary power and energy to be the pioneer in this new path ; but it requires no critical analysis of the works of Paré to show that the great surgeon was a great master, and that scientific Midwifery as well as Surgery had at last found a fitting modern exponent. Paré advises turning by the feet in difficult cranial presentations ; but if this cannot be done, he recommends craniotomy, or delivering by the crotchet,—which instrument he directs us to fix, by the method of Ætius, in the orbit, mouth, or below the chin. He frankly confesses, that although he has carefully studied the position of the foetus in utero, he has been unable to come to a satisfactory conclusion as to what is to be considered the normal position ; while, as regards the causes of difficult labor, he dilates at some length, and on the whole with considerable accuracy. After pointing out with great clearness the serious nature of the impediment caused by cicatrices, the result of former midwifery accidents, he enumerates the various positions of the foetus which interfere with or prevent delivery, and concludes by noting the bad effects of a premature escape of the waters, and of failure of the pains.

At this period, the Parisian school was undoubtedly the first in the world ; and as all the leading surgeons there practiced midwifery, the practice as well as the theory of obstetrics became rapidly developed. Guillemeau, surgeon to the French king, and a pupil of Ambroise Paré, further developed the theories of his master ; but the book which seems to have exercised the greatest influence was the remarkable one of Mauriceau, “*Sur les Maladies des Femmes grosses, et de ceux qui sont accouchées.*” This author gives by far the best account which, up to his day, had appeared of the phenomena of labor as observed by the accoucheur. He criticizes with some asperity the views of Columbus, which, however, we find to be, at least as regards the position of the child in the womb, infinitely more correct than his own. The following are his conclusions on this point : Up to the seventh or eighth month, the child is situated in the centre of the womb, the head being towards the fundus and the face looking directly forwards. About this period

to professional dignity, and an unnecessary interference with a natural process. "Obstetriciam artem nec exercui nec exercere volo," wrote one of these; and there is reason to believe that the words find an echo even now. We need scarcely pause to refute the former of the two objections. We presume we may hold it as proved that, from the very earliest times, women required and obtained assistance at the period of delivery. This assistance was afforded, as we have already seen, by persons of their own sex, and that there is a fitness in this no one will gainsay. If we may judge, however, from the Athenian laws, we may assume that the practice of obstetrics did not prosper in the hands of women; but it must be confessed that there is evidence enough in the works of Arsinoë and Cleopatra, to prove that some of them, at least, were quite familiar with the doctrines and practice of their age. And it must be conceded further, in these days when women are knocking so loudly, and with such importunity, at the portals of professional knowledge, that if the mantle of Mesdames La Chapelle and Boivin could be made to fall on the shoulders of their sisters of the present generation, female delicacy would be saved many a rude shock, and the cause of science would in no sense suffer. But what do they say who repudiate the general practice of the art? Women, they assert, should in their hour of need be attended by women, and only in the case of difficulty or danger should the male accoucheur be summoned. The answer to this simply is, that the assistance of the latter would, under such circumstances, be of no value whatever, as without a knowledge of the healthy or normal standard, which can only be attained by the constant observation of the natural process, ignorance, not skill, would be called upon to act. To the full as rational would it be to ask him to compute distance or space who had no knowledge of the standards of lineal measurement or capacity. Certainly, in the present day, men are required for the practice of midwifery, skilled in medicine and the allied sciences, and who do not think of their dignity, any more than of their ease and comfort, when their services are in this matter required.

In regard to the other objection, we must, of course, admit that parturition is a physiological function. But, in the discharge of this function, there exist in the human species peculiar conditions which exercise, as compared with the lower animals, a special influence upon the progress and issue of labor. What these conditions are will be best understood by a reference to one or two points in comparative anatomy, which reveal certain analogies, the appreciation of which will clear away many difficulties, and a knowledge of which is, in point of fact, almost essential to the student of midwifery.

At an early period of mammalian development, two rods or bars of cartilage may be observed passing more or less obliquely, from the dorsal towards the ventral surface of the embryo near its caudal extremity.¹ The two parts are separated at their dorsal extremity, where they embrace the vertebral column; while in front, in most cases, they meet and form a *symphysis*. This is the primitive pelvis. As the process of development goes on, the cartilage of each side ossifies from three centres, by the union of which the *os innominatum* is formed, the

¹ See Power's "Osteology of the Mammalia." London, 1870.

and usually osseous. The guinea-pig is an exception, as here the union remains ligamentous, and admits of free opening during labor.

In the order Ungulata, the Pecora or true ruminants are characterized chiefly by the great development of the ischial tuberosity, forming a well-marked conical process which is diverted outwards on each side. The symphysis is long, and includes a considerable portion of the ischia, and large epiphyses are observed, forming the articulating surfaces. These parts ultimately become fused by ankylosis. In the Perissodactyla, the greater expansion of the ilia, as seen in a marked degree in the skeleton of the elephant, indicates, at first sight, an approach to the human type; but the narrowing of the pelvis as it approaches the acetabulum, and the comparatively small ischial and pubic portions, at once dispel the illusion.

The Edentata have the pelvis more or less elongated, and the ischia largely developed. In almost all, the ischia are directly connected with the vertebral column by one or more osseous bridges, the single one in the sloth passing from the ischial spine, and thus representing the lesser sacro-sciatic ligament. This is carried to the greatest extent in the Armadillos, where a long unyielding tube is formed by the coalescence of the ilium and ischium on the one hand, and a considerable number of sacral and pseudo-sacral vertebræ on the other. In most of the Edentates, not only the sacro-iliac articulations, but also the symphysis pubis are ankylosed.

The Marsupiala and Monotremata are characterized by the great development of the ischia and pubes, and the development in the tendon of the external oblique muscle of the "marsupial" bones, the function of which is associated with the peculiar development which obtains in these animals.

The facts here cited will suffice to show that the pelvis, in the various groups into which the mammalia have been divided, is formed so as to suit the requirements of the individual. The mode of locomotion, be it leaping, running, or swimming, is revealed to the anatomist by an examination of the pelvic bones, and in every case it will be seen that the preponderance of ilium, ischium, or pubes, is due to the necessity which exists for certain mechanical arrangements, by which alone can the required muscular power be effectively applied to the bony levers. The pelvis is also an efficient support to those organs which are usually contained within it, and especially to those which are connected with the function of generation.

The obstetrician, however, looks at the pelvis from a different point of view. In it he sees the osseous canal through which the product of conception must pass in the act of parturition. He sees in it also the protecting framework which shields the generative viscera from the effects of shock or injury. And, above all, he studies it as a structure which, if abnormal, may seriously obstruct the process of parturition. Let us look, then, for a moment, before quitting the subject, and from this standpoint, at the pelvis of the mammalia. Throughout the whole series, irrefragable evidence is afforded that the pelvis is designed with a direct reference to the propagation of the species; and we find, moreover, that, on the approach of labor, certain modifications

If we now turn to the Primates, we shall be able to show, by a comparison of the human race with those of the mammalia which stand nearest to it in the scale, that the process of childbirth must be more difficult and more obnoxious to serious hindrance than in any—even the highest—of the other mammalia. In all the Simiina the ilium is, as compared with man, much elongated. “Each os innominatum in the adult male gorilla,” says Owen, “is one foot three inches in length, that of man being seven inches and a half; the breadth of the ilium is eight inches and a half, that of man being six inches.” In the lower forms—as the baboons and monkeys—the ilium is even longer, relatively to the other bones of the pelvis, than is here described. The ilia are nearly in a straight line with the vertebral column, and the inferior rami of the ischium are directed almost horizontally inwards, entering into the formation of the pubic symphysis, which, in the ape tribe generally, may be more properly called the *ischio-pubic* symphysis. The form of the cranium is the familiar and ready test, not only in distinguishing between man and the lower animals, but also between the various races of mankind. It is peculiarly interesting to us, however, to observe that a careful examination of the pelvis will also supply the same and as reliable information. The chief peculiarities of structure which are exhibited in the case of the highest of the Simiina have just been noticed. In addition, we observe that the *depth* both of the true and false pelvis is much greater than in the human race, that the sacrum is much narrower, especially in the Chimpanzee, that the ischial spines are more closely approximated, and, above all, that the antero-posterior measurements at the brim prevail greatly over the transverse.

Were we to compare the highest Ape with the lowest Man, we would find the following broad points of distinction. In the Ape, a pelvis with the brim much more inclined, its antero-posterior exceeding its transverse measurement; a bending of the pelvic brim at the ilio-pectineal eminence forming an angle of about 120° , called the *ilio-pubic angle*—a characteristic which, without exception, distinguishes the lower animals possessing pelves; a marked elongation of the ilia; and a parallelism of the symphysis with the vertebral axis. In Man, less inclination of the brim, and a constant preponderance of the transverse over the antero-posterior diameter; the boundaries of the brim here alone in the animal kingdom *on one plane*; great expansion of the ilia, as compared with their length; and the symphysis bent at an angle with the vertebral column. The import of this great gap in development is evident, and has its explanation in the adaptation of man alone of all created beings *to the erect posture*.

The descriptive anatomy of the human pelvis will form the subject of another chapter. We shall here glance only at its special functions, in so far as they may be held to differ from those of the lower animals. In all the other mammals the habitual and only natural position or posture of the animal is prone,—the dorsal surface being superior, the ventral inferior. In all those in which pelvic limbs exist, the weight of the posterior or pelvic portion of the trunk alone is transmitted through the pelvis to the cotyloid cavities, and thence transferred to

the pelvic viscera, are supported by the lower abdominal wall. The contents of the pregnant uterus, therefore, gravitates downwards, in the direction of the arrow in the figure, and, under no circumstances, does the weight of the uterine contents press into the cavity of the pelvis. Even in the Simiina, where the erect posture is to some extent assumed, the greater inclination of the pelvic brim prevents the gravitation of the uterus and its contents into the true pelvis. In a pregnant woman, on the other hand, not only are the pelvic viscera properly supported by the structures which form the floor of the pelvis, but some support is indirectly afforded to the abdominal viscera under certain circumstances. In the pregnant state, the uterus and its contents gravitate downwards and backwards, directly, or almost directly, in the axis of the brim.

FIG. 2.

Diagram showing the direction in which the uterine contents gravitate in the Mammalia generally.

The necessity which thus exists for efficient pelvic support to these parts has not been overlooked. Were the pelvis a simple tube, with the inlet looking upwards, and the outlet downwards, it is obvious that no efficient support could be afforded. But the tube, far from being straight, is in a woman strongly curved—so strongly indeed, that a line drawn so as to represent the axis of the brim and the long axis of the uterus (which we may here assume to be identical), will not fall within the plane of the outlet at all, but behind it, somewhere about the centre of the coccyx. By this curve in the pelvic axis, the lower part of the sacrum, the coccyx, the sacro-sciatic ligaments, the *levator ani* and *coccygei* muscles, and the fascial and soft structure, form a firm floor, by which, in a normal and healthy condition of the parts, perfect support is given to the structures of which we have spoken. But this manifest advantage is obtained at the price of increased difficulty in the act of parturition. This difficulty is, no doubt, to a very great extent, compensated for by the development of the subpubic arch, a peculiarity of the human species which is but imperfectly developed in the lower animals. Without this, indeed, and that shortness of the symphysis in women which admits of its widest development, labor would be always difficult, and often impossible.

The function of the pelvis being thus in every case a complicated one, is so in the human female in an especial degree. The unyielding nature of the structure, essential to the effectual support of the trunk, and the curving of its cavity for the reasons above stated, render child-bearing in this instance exceptionally liable to dangers of various kinds, and thence arises the necessity for that thorough training which can alone engender confidence and develop skill.

The comparative facility with which parturition is effected in the lower races of the human species has also been used as an argument against the practice of midwifery. In reference to this objection, on which we need not dwell, there can be little doubt that the effect, in

extent at the symphysis, as in the guinea-pig, or at the sacro-iliac joint, as in the cow. So far, then, analogy points to the possibility of such a separation. Besides, ankylosis of either one joint or the other, common as it is in the lower animals, is known to be, in the human species, an extremely rare occurrence.

Actual observation, again, by men of such undoubted authority, among many others, as Paré, Levret, and Smellie, has proved, beyond all possibility of doubt, that in women who have died during the parturient period, separation of the bones, now at the symphysis and again at the sacro-iliac joints, has been seen and recorded. Few practitioners of extended experience have failed to observe that women occasionally complain, especially after severe labor, of pain in the neighborhood of these joints, difficulty in walking for a considerable period after delivery, and, more rarely, a grating or crepitant feeling, arising apparently from an unwonted motion of the articulating surfaces upon each other. From which we may conclude that separation *may*, to some extent at least, occur. Cases such as have been detailed by Soemmerring—where the bones at the sacro-iliac joint have been found separated to the extent of an inch—have been supposed to be the result of disease and deposit of pus.

Admitting, then, that some separation may occur, are we to assume that this is to be held as morbid or abnormal, or admitted as one of the essential physiological phenomena of human parturition? It is, we suppose, now universally believed, that, during the last months of pregnancy, the cartilaginous and other structures forming these joints, to be hereafter described, become softened, as if by serous infiltration. The synovial membranes, indistinct before, now become capable of demonstration; and, more important, perhaps, than all, the tissues become thickened, while the ligaments of the joints are relaxed. The effect of such thickening must, of necessity, be, like ivy roots in a wall, to force the bones asunder and, consequently, to increase the pelvic diameters. If, however, there is, as has been asserted, a yielding much more extensive than this, such motion may be assumed to occur in one of two ways: either by a separation of the pubes, involving a hinge motion at the sacro-iliac joint, as in guinea-pigs; or by a movement of the sacrum between the ossa innominata, involving a hinge motion of the symphysis, as in the cow. As regards the first of these, a careful examination of the circumstances under which it may occur, would seem to indicate that a separation of the pubic bones to the extent even of an inch would add very little to the diameters of the brim, and would contribute least of all to the smallest or conjugate diameter. The analogy which the frequent yielding of the symphysis seems to reveal, gave rise, about the end of the last century, to an operation consisting in the artificial section of the symphysis in cases of obstruction at the brim—a mode of procedure which Dr. Matthews Duncan seems to think has been in these days too completely consigned to oblivion.

The other method in which the pelvic capacity may be increased by a movement of these joints, is by the motion of the sacrum between the ossa innominata, somewhat as it has been shown to occur in the

back the coccyx. To the motion of the sacro-coccygeal joint, which is universally admitted, we need not at present specially advert.

From these and other facts disclosed up to the present time we conclude: 1st. That, in the last months of pregnancy, a marked relaxation and softening of the pelvic articulations takes place.

2d. That, as the result of this modification in structure, an increased, though limited, mobility is permitted, which tends to facilitate labor.

3d. That, in addition to the movement of the sacrum on its transverse axis, as above noted (and which may be considered as peculiar to the human species), the manner in which the joints yield is probably very similar to what obtains in the case of the cow. The sacrum acts in this case as a wedge separating the ossa innominata, and causing the symphysis to open with a hinge motion, while, during the violent efforts of labor, the whole sacrum may probably be driven backwards to a trifling extent. Separation of the bones at the symphysis has undoubtedly been observed, but this is probably the exception, while the other is the rule. The development of the synovial membranes seems, when taken along with the above facts, to warrant the conclusion arrived at by Lenoir, "that the articulations of the pelvis proper should not be considered as *amphiarthroses*, but as *arthroses*."

The word "Midwifery," it is proper here to state, is employed in this work in the more extended sense in which it is used by Rigby and other English authors, and not in the limited sense which is implied by the French *accouchement*, and the German *Geburtshülfe*. It signifies, therefore, that Science and Art, which has for its object the management of woman and her offspring during Pregnancy, Labor, and the Puerperal State.

CHAPTER II.

THE PELVIS.

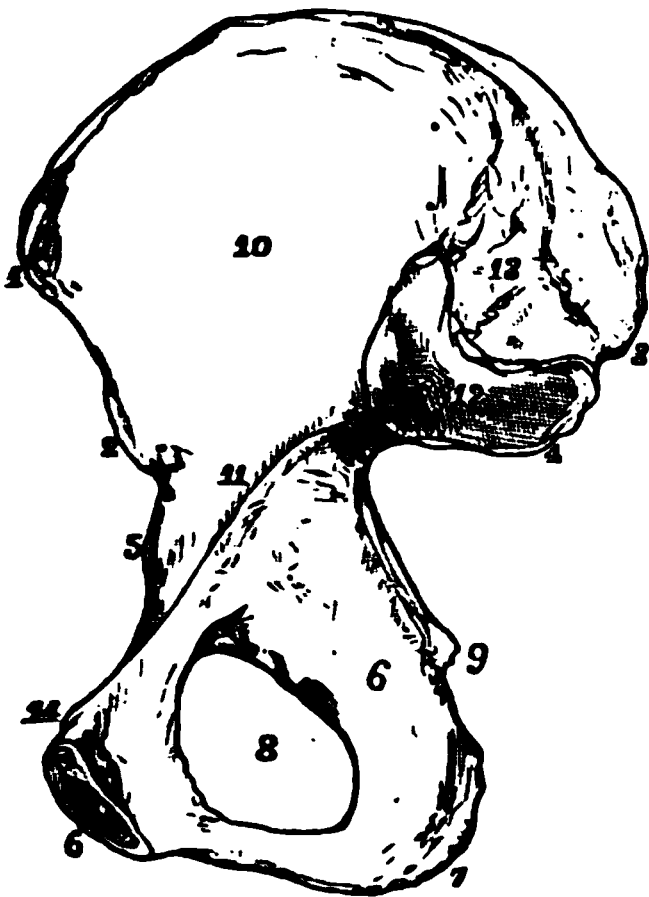
OS INNOMINATUM: SACRUM: COCCYX—THE PELVIS AS A WHOLE: "TRUE" AND "FALSE"—DIFFERENCE BETWEEN MALE AND FEMALE PELVIS; AT BRIM; IN CAVITY; AND AT OUTLET—PELVIC ARTICULATIONS: (a) PELVI-LUMBAR; (b) SACRO-COCCYGEAL; (c) SACRO-ILIAC; (d) SYMPHYSIS PUBIS; (e) OBTURATOR LIGAMENTS; (f) SACRO-SCIATIC LIGAMENTS—INCLINATION OF PELVIS—AXIS OF THE TRUE PELVIS—BRIM OR INLET—CAVITY—OUTLET—PELVIC DIAMETERS—PELVIC ANGLES—DEVELOPMENT OF PELVIS—CERTAIN SOFT PARTS CONNECTED WITH PELVIS; OBTURATOR INTERNUS AND PYRIFORMIS MUSCLES; "FLOOR" OF PELVIS.

THE Pelvis, as has already been incidentally remarked, is composed in Man, as in almost all the other Mammalia, of three parts: 1st, an *os innominatum*, formed by the union of three principal pieces, the *ilium*, *ischium*, and *pubis*, and some other epiphysial parts, the complete

another on the outside of the foramina, which correspond to the articulating and transverse processes of the vertebræ.

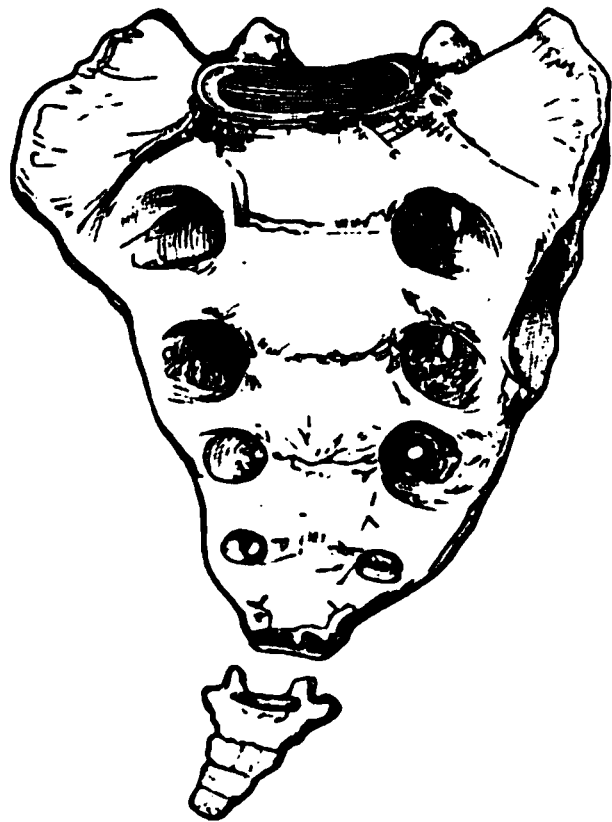
The pelvic or anterior surface (Fig. 7) is concave from above downwards, and slightly so from side to side, and is much smoother than the posterior. Four foramina, larger than those above described, are

FIG. 6.



Internal surface of the same bone.

FIG. 7.



Sacrum and coccyx—internal surface.

provided for the transit of the anterior sacral nerves, and between these foramina are four ridges indicating the boundaries of the original vertebral constituents of the bone.

Laterally, there is presented anteriorly an uneven surface of considerable size, covered in the recent state with cartilage, and corresponding to the iliac articulating surface shown at 12, Fig. 6. This is called, from its shape, the auricular surface, and behind it there is an extremely rough and uneven surface for the attachment of the posterior sacro-iliac ligaments. Below and behind this, the irregular surface gives attachment to the sacro-sciatic ligaments.

The oval surface of the sacrum, which, looking upwards and forwards, represents the base of the bone, is articulated, through the medium of the interarticular disk, with the last lumbar vertebra; while its narrow inferior extremity, transversely oval, is jointed with the superior surface of the Coccyx.

The *Coccyx*, the rudiment of the caudal vertebræ, generally consists of four small vertebral pieces tapering downwards to a point. It derives its name from a fancied resemblance to a cuckoo's beak, and is placed so as to continue, anteriorly and posteriorly, the curve of the sacrum. An oval surface (covered with cartilage and furnished with a synovial membrane) articulates with the apex of the sacrum, and this union is strengthened by two small processes which project upwards to meet the cornua of the sacrum. Not only is the sacro-coccygeal joint a perfect hinge, but the various bones of which the coccyx is composed also admit of some motion in early life the one upon the other. In adult life these

pelvis are evidenced by the greater expansion of the ilia, the minor

FIG. 10.

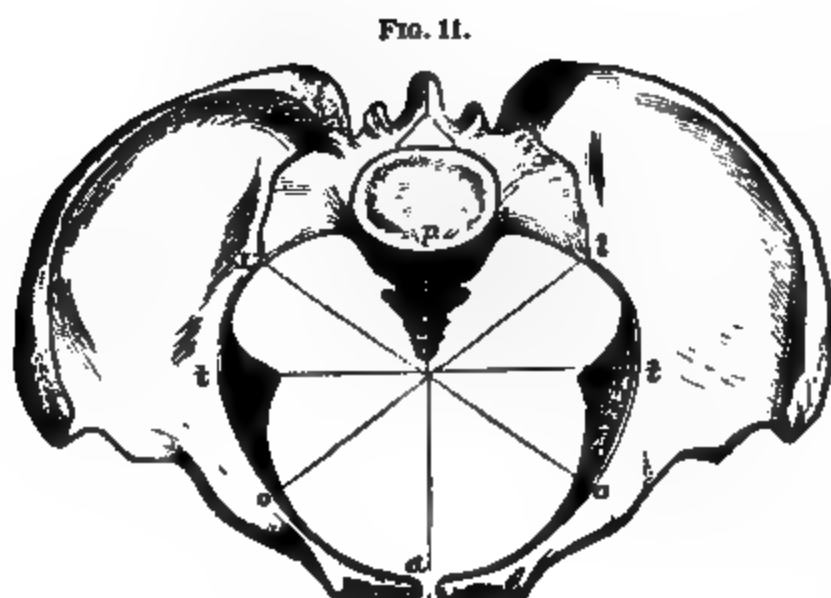


FIG. 11.

Male and female pelvis contrasted, as viewed in the axis of the brim.

degree of projection of the promontory of the sacrum, and the marked general increase in the diameters. In the cavity, the most noteworthy feature of the female pelvis is the diminution in the perpendicular depth, the symphysis being in the male nearly double the depth, while the sacrum is shorter as well as broader, and placed so as to offer a more ample concavity. It will also be noticed, in looking downwards and backwards, as is shown in Figs. 10 and 11, that three projections are seen, posteriorly the sacrum and coccyx, and on either side the converging ischial planes culminating in the ischial spines. These projections, encroaching, as

they manifestly do, on certain measurements of the lower parts of the pelvis, have, as will be explained afterwards, a very important bearing upon the mechanical laws which govern the process of parturition. If, again, we look at the bony outlet, we find here also three projections, posteriorly the sacrum and coccyx, and at the sides the ischial tuberosities. Between the latter is the subpubic angle, while between them and the sacrum on each side is the irregular sacro-sciatic gap, partly closed, as we shall see presently, by powerful ligamentous structures, and much more spacious in the female than in the male.¹ These, the main features which enable us to distinguish between the male and female pelvis, having now been noticed, we shall advert in future to the female pelvis alone.

¹ The greater expansion of the ilia, and divergence of the cotyloid cavities, give the chief peculiarities to the female figure, in regard to which the ancient Greek sculptors are probably not far from the truth in representing their ideal of female beauty as measuring a third more across the hips than the shoulders, while these measurements are reversed in the case of Apollo. The same peculiarity occasions the peculiar swinging gait, which is the more marked in a woman the broader the pelvis is in proportion to her height.

elastic support to organs which would otherwise be liable to frequent displacement downwards.

In addition to the ligaments above described, there are others, some of them—as those of the hip-joint—of great importance; but as they have no special obstetrical interest, their description may here well be omitted.

Inclination of the Pelvis.—If we place the articulated pelvis on a table, so as to bring the tip of the coccyx and the ischial tuberosities into the same horizontal plane, the brim of the pelvis will be found to look upwards and slightly forwards. This was at one time supposed to be the actual position in the erect posture; and many persons now living may remember to have seen articulated skeletons in which the pelvis was so placed. Hence the term “horizontal,” which use and wont has attached to the upper of the two rami of the pubis. Nägele was the first clearly to show, not only that this was an error, but that it was a very gross one,¹ and that the pelvis was, in the normal position, inclined forwards to

FIG. 13.

such an extent that the plane of the brim met the horizon at an angle of 60° or more (Fig. 13, *a*). The same observer, after examining a large number of well-formed female bodies, concluded, further, that the average height of the promontory of the sacrum above the upper margin of the symphysis pubis is about $3\frac{1}{4}$ inches, and that a line drawn from the tip of the coccyx to the lowest part of the symphysis, formed with the horizon at *b* an angle which varies greatly, but which may be stated, as an average, at about 11° . In reference to this, however, it must be borne in mind,

Diagram showing the inclination and axis of the true pelvis.

that the recession of the coccyx implies a movement downwards as well as backwards, and that, consequently, this angle will be rendered still more acute during the passage of the child. The axis of the brim of the pelvis, then, is a line, *c d*, which passes upwards and strongly forwards, while that of the bony outlet is directed downwards and slightly backwards. The axis of the cavity is usually described as the perpendicular of a line drawn from the middle of the symphysis pubis to the centre of the sacro-coccygeal curve.

Axis of the True Pelvis.—If the bony pelvis were a simple cylinder,

¹ “Das Weibliche Becken,” &c. Carlsruhe. 1825.

the soft parts forming the floor of the pelvis should be looked upon as constituting the posterior and inferior boundary of a continuation of the pelvic canal. These parts, which extend from the tip of the coccyx to the posterior commissure of the vagina, are subjected during delivery to an amount of stretching for which nature makes due provision. The sphincter of the anus is dragged asunder, the perineum distends in all directions in a manner apparently incompatible with the integrity of that structure, until ultimately, at the moment of expulsion, the fourchette is driven downwards and carried forwards to such an extent, that a line drawn from the subpubic angle to the edge of the distended perineum, shows the plane of the outlet of the completed pelvic canal to look not downwards, but almost directly forwards (Fig. 14, *a b*). The line *e* perpendicular to, and meeting the centre of the plane, is then the *axis of expulsion*. The tendency of that part of the child which is first born, is to move upwards and forwards under the pubic arch, and in front of the symphysis, in continuation of the curve indicated in the diagram by dotted lines.

Let us now look more closely at the various parts of this tube which attract special notice, viz., the Brim, the Cavity, and the Outlet. The Brim presents (Fig. 11, p. 38) an irregular oval appearance, the long diameter of the oval being from side to side. It has been found on an average to measure in the *antero-posterior* or *conjugate* diameter, *a p*, which is taken from the promontory of the sacrum to the upper edge of the symphysis pubis, $4\frac{1}{2}$ inches. Its greatest *transverse* measurement, *t t*, is $5\frac{1}{4}$ inches. In addition to these, there is also described an *oblique* diameter, extending from the sacro-iliac synchondrosis on each side to a point near the ilio-pectineal eminence on the other. This measures 5 inches, and it must be remembered that these diameters take their name "right" (*r o*), or "left" (*l o*), *oblique according to the sacro-iliac synchondrosis from which they spring*.¹

It will thus be observed that, in the skeleton, the transverse is the longest diameter of the three, but, when the soft parts are *in situ*, this is no longer the case, as the iliacus muscle overlaps the brim so as to diminish the transverse while it scarcely encroaches upon the oblique diameter. The effect of this is that the oblique is now the longest diameter, a fact which we find of great interest and importance when we study the relation of those parts to the foetal head.

The Cavity of the pelvis is the whole tube between the brim and the outlet. As a general rule, the deeper the cavity the more difficult is the labor, for in this case the pelvis approximates in its formation to the male type. If the diameters are proportionally enlarged, labor may be, it is true, quite easy; but the rule undoubtedly is, that in the case of the tall handsome woman with dignified gait and carriage, the probability of a difficult labor is much greater than in the short wide-hipped woman, in whom the swinging, or (to put it less gallantly) the

¹ In regard to this there unfortunately exists some discrepancy. The diameters are named "right" and "left" as in the text by the best English and German writers, but some eminent French and American authors have named them from the cotyloid cavity, thus inverting the meaning of the terms.

The facts which are brought out by those figures are chiefly these: (a.) That the transverse measurement of the pelvic tube becomes progressively diminished from above downwards, being greatest at the brim and smallest at the outlet. This is due, as a single glance downwards in the axis of the brim will show, to the gradual approximation of the ischia (Fig. 11). (b.) That the conjugate diameter is, on the contrary, increased from above downwards, in consequence of the recession or curve of the sacrum, progressively from brim to outlet, if we allow for the bending back of the coccyx. These facts, which are associated with a remarkable rotation which the child undergoes during labor, are more clearly shown when, as in the following table, the figures above noted are brought into juxtaposition. Along with these, a few of the more important of the many measurements which have been made of the female pelvis are also set down in inches.

FIG. 16.

Outlet of the female pelvis.

1. Circumferential measurement of the Brim,	17
2. Measurement from the promontory of the Sacrum to the centre of the Cotyloid Cavity (Sacro-cotyloid),	8½
3. Between widest part of Iliac Crests,	10½
4. " Anterior superior Spines of Ilium,	10½
5. " Front of Symphysis and Sacral Spines,	7
6. <i>True Pelvis.</i>	
Brim,	Conjugate 4½ Transverse 5½ Oblique 6
Cavity,	5½ 5 [5½] ¹
Outlet,	5 4½ [4½]

All the measurements given in this table are, it must be remembered, those of the skeleton—no allowance being in any case made for the soft parts. The encroachment of the psoas and iliacus muscles and fascia reduce the transverse diameter of the brim by about half an inch, while the other diameters of the brim, as well as of the cavity and outlet, are only reduced by an eighth to a quarter of an inch at the most. The oblique diameters are least of all affected, but, owing to the presence of the rectum on the left side, the *left* oblique diameter is slightly shorter than the right. These facts have to be borne in mind in the course of examinations which are made with a view of estimating the capacity of the pelvis in its various parts,—a question often of vital import in the practice of Midwifery; and in such investigations it is

¹ The oblique diameters of the cavity and outlet are placed in brackets, as, not being taken from fixed bony points, they are of comparatively little importance.

² 6 when coccyx forced back.

External Organs of Generation.—Immediately over the symphysis pubis, above and in front of the opening of the *vulva* or *pudendum*, is a firm cushion-like eminence, about two inches in depth and three inches transversely. This, which is called the *Mons Veneris*, varies in prominence according to the conformation of the pubes, and the amount of adipose and cellular tissue in it and the contiguous parts. After puberty, it is covered with hair, and is abundantly furnished with sebaceous follicles, which were supposed by Moreau to contribute in some measure to the dilatation of the external parts at the moment of delivery. Continuous with this structure, extending downwards and backwards, and becoming gradually thinner in their course, are two rounded folds of integument, which, diverging from each other, leave in the median line an elliptical interval between them. These are named the *labia majora*, *labia externa*, or *labia pudendi*. They present an external surface, which is lined with skin similar to that of the *mons veneris*, and an internal surface covered with mucous membrane, which is the commencement of the genito-urinary tract. Behind, the thinner margins unite, forming the posterior commissure of the vagina. The *fourchette*, or *frænulum pudendi*, is a transverse fold in front of this, which resembles and has been aptly compared to the continuation of the skin at the roots of the fingers, and is very generally torn in first labors. The depression between the fourchette and the commissure has been called the *fossa navicularis*. Between the skin and superficial fascia of the labia there exists a purse-shaped sac, which has been described by M. Broca as analogous to the dartos tunic of the scrotum. This sac is filled with fat and cellular tissue, is the receptacle occasionally of hernia, and to it have been traced the terminal fibres of the round ligament of the uterus.

The *perineum* extends from the posterior commissure to the anus, and is usually about an inch and a half in length. It is made up of highly distensible cellular tissue, and has been said to contain some yellow elastic tissue. It is susceptible of great distension during labor, without, under ordinary circumstances, any risk of rupture.

On separating the labia majora, the *labia minora* or *nymphæ* are brought into view. These are two thick mucous folds, somewhat resembling the comb of a cock, about an inch and a half in length, having their origin on the inner surface of the labia majora, and becoming wider as they pass upwards and forwards, converging towards the clitoris, with the prepuce of which they are continuous. The *clitoris* is a small erectile tubercle, situated somewhat above the level of the lower margin of the symphysis pubis. Like the penis of the male, it has a suspensory ligament, two crura, two corpora cavernosa, and a glans, but has no corpus spongiosum nor urethra. Two muscles, corresponding to the ischio-cavernous, are in the female called “*erectores clitoridis*.” The *vestibule* is a small triangular space, bounded above by the clitoris, below by the urethra, and on either side by the diverging nymphæ. It is about an inch in length, is smooth on the surface, and is specially important as a guide to the finger of the accoucheur in the introduction of the catheter—an operation which should always be performed, if possible, without exposing the patient. The *meatus*

constitute elephantiasis has also, although rarely, been noticed. Entire absence of the clitoris, unassociated with any other form of malformation, is very rare. It is sometimes so small that it can with difficulty be discovered, and in these cases it might be erroneously supposed to be absent; but it may be assumed that, unless other parts, such as the nymphæ, are absent, the clitoris is only rudimentary. This organ is much more frequently enlarged, generally, no doubt, as the result of disease, but sometimes it is a pure hypertrophy of the normal tissues, when it may approach the dimensions of the penis and constitute one of the so-called forms of hermaphroditism. An extreme development of the nymphæ—common, as we have seen, in certain races—may occasionally be met with as a peculiarity of structure, and cases are recorded where the nymphæ have been found increased to two or even three pairs.

The folds of which the hymen is composed, ordinarily thin and fragile, are occasionally developed to such an extent as to prevent sexual congress; while, in some cases, it completely closes the mouth of the vagina, preventing not only coition and impregnation, but also menstruation, and, for the latter reason, if not for the former, rendering an operation necessary—which is usually a very simple one. Another condition of these parts which may call for operative interference, is what has been called *vaginismus*, where there exists such spasmodic contraction as prevents proper sexual contact, dilatation with or without the use of the scalpel being in such cases often found necessary. Congenital absence of the vagina is by no means of very rare occurrence. In extreme cases, the whole organ is wanting—the vulva terminating abruptly at the point where the vagina, in the ordinary condition of parts, commences. In others, a portion of the tube exists, but ends in a cul-de-sac at some distance from the os uteri; while, in another class of cases, there is a narrow canal, sufficient only for the passage of the menstrual fluid. In many of these cases, free incision may be found necessary, in order, by giving egress to the menstrual discharge, to relieve the serious symptoms which arrest of that important function is apt to engender.

A vertical septum occasionally exists, constituting the phenomenon of double vagina, in which, if complete, there is a hymen to each tube. More frequently, however, the septum is incomplete—either commencing at the vulva and terminating so as to leave the tube single at its upper part, or, conversely, commencing at the upper part and stopping short of the mouth of the vagina. In the latter case, we would expect it to be associated with double uterus. Transverse membranous septa also exist as congenital malformations, but much more frequently as the result of inflammatory action, or of the accidents of previous labors.

Many of the conditions above detailed may give rise to serious impediments, either to delivery, to impregnation, or to the proper performance of the menstrual function, and, in consequence, delicate, and even dangerous operations may under such circumstances be required.

THE INTERNAL ORGANS OF GENERATION.—These are the Uterus, the Fallopian Tubes, the Ovaries, with various ligamentous and other structures intimately connected with them.

usual to consider the parts to be in their normal relative position when the bladder and rectum are each moderately distended. The opinion which is usually adopted, and which is founded on estimates of this nature, is, as has been said, that the axis of the uterus is identical with the axis of the pelvic brim. It is admitted that, in many cases, and especially in those in which the vagina is very short, the fundus falls more or less backwards so as to bring the uterine axis more into a line with that of the vagina, while in some cases the uterus is curved so that the body forms an angle with the neck.

This bending of the uterine axis, instead of being admitted as an exception, is recognized by many of the best authorities as the normal position of the womb, a view which careful personal observation leads us to confirm. It is a point of great importance, in making examination on the living subject, that it should be clearly recognized that the finger, in a digital examination, approaches the os uteri in a direction corresponding to the axis of the vagina, which frequently forms nearly a right angle with the uterus.

If this is overlooked, error is sure to creep into our calculations, as has evidently been the case in certain instances of inaccurate description of the anatomical relations of the womb. The opinion here expressed as to the position of the womb is in accordance with that of Kohlrausch, as shown in his plates, and is confirmed by Dr. A. Farre in his admirable essay in the *Cyclopædia of Anatomy and Physiology*, from which the diagram (Fig. 23) is taken. According to these able observers, when the bladder B and the rectum C are moderately distended, the fundus of the uterus is directed upwards and forwards, and the neck

downwards and very slightly backwards towards the orifice of the rectum. The relative heights of these parts are determined, it is assumed, by two lines: the one, *a—u*, being drawn from the lower border of the symphysis pubis to the promontory of the sacrum, to mark the height of the fundus; and the other, *b—b*, carried from the same point anteriorly to the lower margin of the fourth sacral vertebra behind, to mark the plane of the orifice of the uterus. The line *c—c* indicates the axis of the body of the uterus. The representation, therefore, given in Fig. 23 is, as regards the position of the womb, probably nearly correct, subject, of course, to numerous modifications, in consequence of its mobility, and the influence exercised upon it by neighboring organs.

FIG. 23.

Diagram, showing relative position of pelvic viscera.
(A. Farre.)

CHAPTER IV.

FEMALE ORGANS OF GENERATION—(CONTINUED.)

OF THE PROPER TISSUE OF THE UTERUS—OF THE MUCOUS LAYER; ITS STRUCTURE AND GLANDS, IN THE BODY AND CERVIX—BLOODVESSELS OF THE UTERUS—LYMPHATICS AND NERVES—MALFORMATIONS AND ABNORMAL CONDITIONS—THE OVARIES: THEIR STRUCTURE—THE GRAAFIAN VESICLES AND THEIR DEVELOPMENT—THE OVUM—PHENOMENA OF OVULATION—FORMATION OF THE CORPUS LUTEUM—THE CORPUS LUTEUM OF PREGNANCY DISTINGUISHED.

THE *Proper Tissue*, which lies immediately beneath the peritoneum, and which constitutes the greater part of the walls of the uterus, is very dense in structure, and, except during pregnancy or a menstrual period, is of a grayish color in section, and displays numerous bloodvessels, some of them of considerable size. It is thickest at the middle of the body and at the fundus, thinnest at the Fallopian tubes, and is composed throughout of bundles of muscular fibres of the plain variety. These fibres in the unimpregnated condition are interlaced, disposed very irregularly in bands and layers, and mixed with fibro-areolar tissue, which is more abundant near the external surface. As in the case of other hollow viscera, the muscular elements may be described as consisting of an external layer, the fibres of which have a general longitudinal direction, and of an internal or circular layer. From the irregular manner, however, in which, in the unimpregnated uterus, the bundles of fibres are disposed, and the intimate union which subsists between them, this seems on the first glance to be somewhat of a forced analogy. And it would probably remain so, were it not that during pregnancy the stratification of the muscular tissue becomes much more distinct, so as to render the comparison quite justifiable, a fact which will be brought out more clearly afterwards. Anatomists usually divide this tissue into three layers, external, intermediate, and internal.

Mucous Membrane.—The very existence of this membrane was long disputed, the obvious reason being that it differs so much from other mucous membranes, that physiologists with some show of reason refused to admit the analogy. More modern and more exact observations, however, leave no doubt in these days as to the propriety of classifying it as it is here named. The descriptions which are usually given of this membrane by anatomists are very meagre, and in some respects inaccurate; this may serve as our warrant for examining its structure and functions a little more in detail than under other circumstances might have been necessary. Although usually described as a thin membrane, it is, on the contrary, probably the thickest mucous membrane in the body, constituting, according to M. Coste, in the cavity, about one-fourth of the entire thickness of the organ. In this situation, it is of a reddish tint, but in the cervix, where it is much thinner, it is

loses its alkalinity, and also its transparency, by contact with the acid mucus of the vagina. The cavity of the cervix is lined with an epithelium, which, in its lower half, is squamous, like that of the vagina. About midway between the outer and inner os, it assumes the characteristics of the ciliated and columnar epithelium of the cavity.

The uterus is supplied with blood from two sources. The *ovarian* arteries have their origin, like the spermatic in the male, from the aorta, at a point a little below the renal arteries. Passing over the psoas muscles, and occupying a fold in the peritoneum, which is indicated in Fig. 27, they pass between the layers of the broad ligaments, forming what have been described as the ovario-pelvic ligaments. They follow, in their course towards the ovary, an extremely tortuous course, which admits of free distension during pregnancy without any risk of diminution of their calibre. Giving off branches to the ovary and round ligament, they now pass inwards to join the *uterine* arteries on each side. These latter spring from the anterior division of the internal iliac, pass between the layers of the broad ligament downwards towards the neck of the uterus, then upwards, pursuing, like the ovarian arteries, a very tortuous course, and, giving off numerous branches to the uterus, effect a union with the ovarian. Frequent anastomoses take place, and the branches may be seen to lie in little canals or channels on the surface of the uterus, before they penetrate more deeply. The veins correspond to the arteries just named, and are of considerable size. They form plexuses, which communicate freely, and during pregnancy their calibre becomes enormously increased. Within the substance of the uterus, the ramifications of the arteries retain their spiral form, but become straighter as they approach the mucous membrane, where fine branches surround the utricular glands, and ultimately form, as has been shown (Fig. 34), a fine network on the free surface of the membrane. The veins which convey the returning current are, at their origin, of small size, but become much larger within the substance of the womb, attaining during pregnancy a size so considerable that they are designated the *uterine sinuses*. The cervix is very much less vascular than the body and fundus.

Numerous lymphatics, which are fully developed only during pregnancy, have been traced to the uterus. Some doubt still exists, however, as to the precise source of the nervous supply. All agree that the chief supply is from the sympathetic system,—the hypogastric, renal, and inferior aortic plexuses being all believed to contribute. An idea generally entertained is, that the sacral nerves send some filaments to the cervix, but this has been denied by Dr. Snow Beck,¹ who failed in his dissections to discover any single filament proceeding from this source. M. Jobert has asserted, again, that no nerves whatever are sent to the vaginal portion of the cervix; but this has been warmly refuted by M. Boulard. There can be no doubt that the presence in the cervix of filaments from a cerebro-spinal source, and the absence from its vaginal portion of all nerves whatever, are both

¹ Philosophical Transactions, 1846. Part II, p. 219.

the normal adult condition, the persistence, within the cavity, of rugæ, similar to those of the cervix, and the thinness of the parietes.

Of the Ovaries.—Projecting on either side from the posterior surface of the broad ligament, and invested with a special fold of its posterior layer, are the important organs within which is elaborated that which the woman contributes to the propagation of her species, analogous therefore in this, as in other respects, to the testicles of the male. They are connected (see Figs. 27, 28, and 29) with the uterus by a special ligament already described, and also through the Fallopian tubes, to one of the fimbriæ of which they are permanently adherent. In shape, the ovary is a flattened oval. It varies greatly in size, according to age, and in different individuals of a similar age; but it may be set down as, on an average, about eighty grains in weight, and an inch and a half in extreme length. From the manner in which it is embraced in the peritoneum, it is free on two sides, and on the posterior border, and attached to the broad ligament by a kind of mesentery along the anterior border only, where, between the layers, the vessels and nerves enter. It attains its greatest size after puberty, and is, up to this period, smooth on the surface. During pregnancy, the position of the ovary is completely changed; but in the unimpregnated condition it will be found lying deeply in the lateral posterior part of the pelvic cavity, covered by the small intestines, and to some extent by the Fallopian tube of the same side. Beneath the peritoneal covering, a remarkably tough layer, somewhat white in color from a sparseness of bloodvessels, binds the proper structure of the organ together, giving support and protection to it, and to the important structures which it contains: this is the *tunica albuginea* of the ovary. The bulk of the organ beneath this is composed of highly vascular tissue of a pinkish color, which is called the *stroma* of the ovary.

The Graafian Vesicles.—If a longitudinal section is made through a mature and healthy ovary, these vesicles are brought into view, imbedded in the stroma, and varying considerably in size. In number and in situation, they differ greatly according to age. In infants and young children, the ovary is found to be composed, within the tunica albuginea, of two distinct portions,—one internal, corresponding to the stroma in the mature organ, and the other external, of considerable thickness and density. It is in the latter, or peripheral portion alone, that, at this time, the Graafian vesicles are to be found, in enormous numbers, but as yet of small size and rudimentary condition. As puberty approaches, the distinction between the peripheral and central portion of the stroma becomes gradually more indistinct. Some of the vesicles enlarge and, according to Schrön, retreat in the first instance toward the centre of the ovary. When puberty is attained, a certain number of them enlarge, and those which have attained the greatest size approach the surface. A few of them are from $\frac{1}{20}$ th to $\frac{1}{8}$ th of an inch in diameter, or even more; but the great majority remain much smaller. Their number is also greatly diminished as compared with these existing in the ovaries of children, so that we may assume that a large proportion is absorbed. This number is still, however, very considerable, and has been computed by Henle at 36,000 in each ovary

diagram. The cavity is filled with the albuminous fluid proper to it, and is lined with the membrana granulosa; in the conical projection of which, on the side next the surface of the ovary, the ovum is seen imbedded among the granules. Externally, the so-called vascular layer is indicated by the numerous bloodvessels which penetrate it; while the internal layer, or true ovisac, is left between them. The latter is represented as free from bloodvessels, in order to distinguish them in the diagram, but this is, as we have seen, an incorrect impression, which the term "vascular," as applied to the external layer only, is apt to engender. The peritoneal covering is also represented, and, within the stroma of the ovary, several minute vesicles in process of development.

If the surface of the ovary be punctured, while a mature Graafian vesicle is projecting, and the contents of the latter pressed out, a small spherical body may be observed, if care be taken, covered with granular matter in greater or less quantity. It is more opaque than the medium in which it is suspended, and is remarkably constant in size, being about $\frac{1}{16}$ of an inch in diameter. It is comprised of the following parts:

a. A thick, transparent envelope, which was called by Baer, the distinguished discoverer of the ovum in the Mammalia, the *zona pellucida*. As this refers only to its appearance, many physiologists prefer to call it the *vitelline membrane*, or *membrane of the yolk*. This membrane completely surrounds the ovum, and leaves no such circular aperture as Barry imagined to exist for the purpose of admitting the spermatozoa.

FIG. 39.

FIG. 40.

Diagrammatic representation of the ovum, as it escapes from the Graafian vesicle.

Development of Graafian vesicles in the sow.

b. The *Yolk*.—The cavity inclosed by the zona pellucida is filled with a substance which is viscid and faintly granular, and which readily escapes when the sac is ruptured. It can scarcely be described as a fluid, as it retains its spherical form after rupture of the sac, and may, according to Bischoff, be broken into segments. It has no investing membrane other than the zona pellucida.

c. The *Germinal Vesicle*.—In the middle of the yolk, in young children, and in contact, in adults, with some part of the periphery of the investing membrane, a little vesicle is found, apparently, when seen in the more opaque medium in which it is suspended, quite transparent and colorless. This is the germinal vesicle—first described in the ova of birds by Purkinje, and discovered in the Mammalian ovum by Coste. It is slightly oval, about $\frac{1}{20}$ of an inch in diameter, and

This evolution of the ovum is accompanied by important changes in various parts besides the ovary. In so far as the uterus is concerned, these changes will come to be considered under Menstruation. At present it need only be observed that the whole of these organs become engorged. The Fallopian tube loses its pale color internally, and often becomes of a violet hue from extreme congestion. This is more marked towards the fimbriated extremity, which completely embraces that portion of the ovary where the mature vesicle is about to give way. The ovum is thus received *into* the Fallopian tube, but the rupture which admits of the dehiscence does not terminate the series of changes of which the ovary is the seat.

Before attempting a description of these changes, however, we must consider for a moment the conditions under which rupture of the Graafian vesicle occurs, and the laws which determine this rupture.

The celebrated experiments of Bischoff, as detailed in his well-known work,¹ have supplied most of the facts upon which, even at the present day, the conclusions of physiologists on this subject are based. From these, and from the corroborative results obtained by subsequent observers, it is clear that ova may, in the mammalia, as in animals lower in the scale, be discharged from the ovary independently of sexual intercourse, or of any kind of influence from the male.² In other words, sexual contact or excitement is not, as the earlier observers down to Barry believed, the one essential determining cause of the discharge of ova. From experiments on rabbits, which were conducted by Coste, it seems, however, more than probable that sexual congress may precipitate a rupture which, but for the excitement, would have been delayed. The immediate cause which leads to a rupture is thus somewhat obscure, but we recognize the fact that the occurrence is intimately associated with the phenomena of ovulation, of which, in women, the periodic menstrual flow is the external manifestation.

We have already seen that the internal layer of the Graafian vesicle presents a yellow color previous to its rupture, becomes wavy in outline, and is very considerably thicker. This change of color has been shown by Farre to be due to the presence of very minute oil granules, which give to the structure a yellow hue; hence the name given to the follicle during the period of decline—the *Corpus Luteum*. After rupture, a laceration, fissure, or scar, marks on the surface of the ovary, the spot whence the ovum escaped, and a longitudinal section, made through the ovary in this situation, will generally bring the yellow body into view. At first its distinguishing characteristics are but faintly shown; and it is this fact which caused Raciborski to assert that the corpus luteum was not found before rupture. Undoubtedly, however, the first stage of its formation is while the ovum is still within the vesicle; but it is only after rupture that the change in color becomes quite distinct—a change which Raciborski supposed to be due to an absorption of coloring matter from the blood-clot which fills the

¹ Beweis der von der Begattung unabhängigen periodischen Reifung und Lösung der Eier, &c. 1844.

² See Raciborski, "De la ponte périodique chez la femme et les Mammifères." 1844.

Sometimes, they soften so rapidly, that they are completely reabsorbed before the folds of the internal layer have actually come in contact or contracted adhesions.

Widely different is the state of matters where the ovum has been impregnated. In this case, the functional activity of the uterus is, in a measure, shared by the ovaries, and manifests itself in an increased vascularity, which, instead of disappearing, as at the end of a menstrual period, is maintained, more or less, during the whole course of the pregnancy. It is, probably, in consequence of this, that the corpus luteum of pregnancy goes through a series of transformations, so much more elaborate, and extending over a period the duration of which is so much longer. Taking the duration of an unimpregnated follicle as about two months to complete obliteration, the corpus luteum which accompanies pregnancy may be said to last usually for thirteen or fourteen months, while traces of it may be found at a still later period.

Such a history involves the idea of special structure and modified development, and this a study of the facts amply corroborates. When pregnancy succeeds or accompanies the phenomena of ovulation, the earlier changes are the same as those already described; but instead of softening and rapidly shrinking, as in the former case, the inner coat, or ovisac, continues to develop in thickness, and deepens in color, in consequence of an increase in the number of oil-granules in its substance. There does not seem, in the first instance at least, to be any contraction whatever of the external membrane. On the contrary, there is some reason to believe that, at this stage, it often yields, so as to admit of an increase in the entire diameter of the vesicle, and, indeed, if we admit Coste's description to be correct, when he describes the corpus luteum of pregnancy to be "as large as the ovary itself," this can only be accounted for in the manner described. The size of the ruptured follicle varies considerably, but occupies, usually, during the first four months, about a fourth, a third, or a half of the entire ovary. During the period immediately succeeding impregnation, rapid hypertrophy of the inner coat goes on, and it becomes folded together into convolutions as before. The material being abundantly supplied, while the development still continues, causes the convolutions to be firmly pressed together, while their free surface encroaches upon the cavity. At the end of two months, the condensation of the hypertrophied tissue of the ovisac will be found to have imparted to the follicle a considerable amount of solidity, which is quite obvious when it is pressed by the finger. Bloodvessels run through it, from the circumference towards the centre, marking, probably, the situation of the original folds. These latter are no longer distinct, and are so compressed laterally that the layer has now the appearance of a very thick yellow coat surrounding the diminished cavity, which is up to this time usually circular in form, as shown in Fig. 44.

The blood-clot which originally occupied the cavity, or, if we choose to adopt the view of Coste, the tinged lymph which is effused after rupture, undergoes certain metamorphoses, which ultimately result in the formation of a milk-white coat which lines the cavity, taking the place, as it were, of the original granular membrane. This membrane,

development and longer duration, its hardness, its vascularity, and, at a later stage, by the formation of the white lining membrane, and large central stellate cicatrix.

The presence in the ovary of a corpus luteum is no evidence of pregnancy, unless the characteristics above indicated are distinct and unequivocal,—under which circumstances it is a certain sign.

With reference to the above conclusions, it may be remarked that much confusion has arisen from the employment loosely of the terms “true” and “false,” as applied to the corpus luteum, in so far as they are assumed to imply a distinction, which proves or disproves the occurrence of pregnancy. “There is as little reason,” says Farre, with justifiable emphasis, “for the use of the last term as there would be for denominating a child a false man. . . . These terms actually represent the same body, only in different stages of growth or decay.”

During the whole of the childbearing period of a woman’s life, the ripening and dehiscence of the Graafian vesicles are of periodic occurrence. In those animals in which plural births are the rule, several vesicles ripen and discharge their contents at, or near, the same time; but in Man this is exceptional, and we thus find that one vesicle only, as a rule, ripens at a time, bursts, discharges its contents, and rapidly shrinks as it retires towards the centre of the ovary; to give place in their turn, in a normal condition of the parts, to a constant succession of vesicles, which, one by one, run a similar course after discharging their ova.

Although the phenomena of menstruation are undoubtedly associated, in the most intimate manner, with those of ovulation, the observations of Ritchie¹ seem to show that, under certain circumstances,—the nature of which is not well understood,—menstruation may occur without any rupture of a follicle; while, on the other hand, as he believes, rupture of a follicle may occur independently of the excitement of menstruation. Be this as it may, the rule is otherwise; and there is every reason to believe, further, that during pregnancy and suckling, while the uterine functions are in abeyance, those also of the ovary are temporarily arrested, in so far as the development of new Graafian vesicles is concerned,—the whole generative force being, as it were, turned into other channels.

The numerous lacerations which, in consequence of repeated ruptures, take place on the surface of the ovary, leave, in the process of healing, corresponding cicatrices. On this account the smoothness of surface is soon lost, and it becomes more and more fissured and wrinkled, until, towards the end of the childbearing epoch in a woman’s life, the ovary is so irregular on the surface, as to warrant the comparison which Raciborski has instituted between it and the kernel of a peach. After this, the organ becomes atrophied, and, like the uterus and other parts, is restored, in some measure, to the form which it presented in early life.

¹ London Medical Gazette, 1843.

been shown, certain essential phenomena which are, so far, almost identical with what we observe in other mammalia. But there is here a special phenomenon superadded, which is in fact the external manifestation of what we know to be taking place internally. This consists in a discharge from the uterus of nearly pure blood, which lasts usually for several days. It is called the "catamenial" or "menstrual discharge," as it occurs very constantly at intervals of a month; the occurrence being, in its course, usually designated as Menstruation.

A very warm discussion has been maintained for many years as to whether the "rut" and "menstruation" are to be held as analogous. Up to a certain point, the analogy is admitted by all; but it must be conceded that, between the two, distinctions and even contrasts are found, on careful examination, to arise, which seem to challenge the truth of the assertion which many have made, that the phenomena are physiologically identical. Without expressing any confident opinion as to this *questio vexata*, we may here mention the chief points, in addition to the sanguineous discharge, in which they differ. Impregnation takes place during the excitement of the rut, while as a general rule it occurs in women about a week after menstruation, during the period of rest. Again, there succeeds to the rut a period of inappetence, when not only does the female refuse the male, but in some cases no semen is, as we have seen, secreted; in the human species there is, strictly speaking, no period of inappetence, not even excepting the period of the menstrual discharge, so that at any time impregnation *may* occur. Great as these differences undoubtedly are, and even if we admit that they destroy the identity of the acts, they are scarcely sufficient to warrant us in rejecting the mere analogy; for, although the subject is still obscure, a more accurate knowledge of the time occupied by the descent of the human ovum may show that the above points of contrast are more apparent than real.

Menstruation is familiarly termed by women the "courses," "monthly illness," or "period." It is not to be looked upon as an isolated act, but as one of the important series of phenomena which occur during ovulation; and as such it requires special and careful attention. Its first appearance is associated with the other signs of puberty. The approach of this is indicated by an alteration in the form of the pelvis, and a consequent change in figure and gait; by the growth of hair on the pubes, the rapid development of the mammæ, the greater projection of the nipple, and the deeper color of the areola. These physical modifications are generally associated with very characteristic moral changes. A frank romping manner gives place to one more timid and gentle, and the loud voice and ringing laughter of childhood is replaced by subdued tones and bashful reserve. A Graafian vesicle now for the first time comes to maturity, and projects on the surface of the ovary, which is embraced by the fimbriæ of the Fallopian tube, while the whole of the organs, including the uterus, become highly congested.

According to Boerhaave, the first menstruation is accompanied with a certain amount of fever, as the result of the excitement of the genital organs. The girl complains of lassitude, hypogastric fulness, lumbar and sacral pains, slight itching and tumefaction of the external genitals,

and to no one are we more indebted than to Mr. Robertson, of Manchester, for clearing away the errors which have been long promulgated on these points. The following table, which shows the period of the first menstruation in 8983 cases, is the result of a very careful analysis of the most reliable statistics which have been published in Europe on this subject.

Some idea is here given of the variation in the different countries of Europe, and shows the very small proportion of cases in which menstruation first appears under ten or over twenty-two years. The period, as will be observed, varies very considerably, about the age of sixteen being the time at which it most frequently shows itself in this country. At any age, however, between twelve and twenty, the function may be established, without any peculiarity whatever in the attendant symptoms or deterioration of the general health; but if beyond these limits, it may be looked upon as exceptional and irregular, although even then, as in the cases alluded to, the health may in no way suffer.

AGE.	ENGLAND.	FRANCE.	GERMANY.	NORWAY.	RUSSIA.	TOTAL.
	Roberton, Lee, White- head, and Murphy.	Brierre de Boismont, Raciborski, Bouchacourt.	Osiander.	Faye.	Lebrun.	
Under 10,	14	16	...	...	...	30
10 to 11,	64	41	...	...	...	105
11 " 12,	103	138	...	...	...	241
12 " 13,	278	209	3	4	...	494
13 " 14,	595	258	8	4	...	865
14 " 15,	1034	355	21	18	1	1424
15 " 16,	1178	411	32	14	15	1650
16 " 17,	1307	349	24	20	27	1727
17 " 18,	714	287	11	13	35	1060
18 " 19,	531	190	18	13	13	765
19 " 20,	213	102	10	6	6	337
20 " 21,	104	66	8	8	2	188
21 " 22,	18	31	1	3	1	54
Over 22,	17	23	1	2	...	43
Total, . .	6170	2476	137	100	100	8983

Once established, the menses should return with periodic regularity during the whole childbearing epoch. The recurrence of the discharge is always attended with local, and generally with constitutional, symptoms. The latter are identical with those which accompany the first menstruation, only less in degree, and constitute what has been termed the *menstrual molimen*. The only circumstances which normally arrest this function of the uterus are the occurrence of pregnancy and lactation, during which the ovarian and uterine functions are generally in complete abeyance. If, under other circumstances, it should disappear during the childbearing epoch, it is regarded as an indication of some morbid condition, usually constitutional, and which declares itself as a rule by the presence of other symptoms. It may last from one to

produce deleterious results. During the height of the period it is composed, as the researches of Donné, Pouchet, Letheby, and others have abundantly proved, almost entirely of pure blood, mixed with a certain quantity of mucus. During the period of invasion and decline, the mucus predominates, the color being in direct proportion to the number of blood-corpuscles, which are seen by the microscope, mixed with epithelial scales and with mucus-corpuscles from the cervix.

There is one striking peculiarity which serves to distinguish this from ordinary hemorrhagic discharges—its want of coagulability. This was at one time supposed to be of itself sufficient evidence that it was not blood, or was blood deprived of its fibrin; but no doubt now remains that the arrest of coagulation depends upon the mixture of the acid secretion of the vagina with the still fluid blood as it escapes from the os; which not only maintains the fibrin in solution, but also renders it difficult of chemical detection. When the quantity is excessive, constituting the affection known as menorrhagia, nothing is more common than to find clots discharged, the blood being then so far in excess as to neutralize the acid in the vagina. And, besides, it has been proved that if the blood be collected as it escapes from the os, and before it mixes with the mucus, it is coagulable and alkaline in reaction. These facts suffice to prove that the discharge is a hemorrhage.

Source of the Menstrual Discharge.—There are few subjects in physiology which have given rise to more discussion than this. Some observers have seen blood oozing from the surface of the vaginal mucous membrane, while others have traced it to the os and cervix uteri; and on isolated observations such as these, theories on the subject have been founded. Admitting the facts upon which these theories have an unsubstantial basis, we recognize in them nothing more than examples of *ricarious* menstruation, a term which has been applied to those cases in which the menstrual molimen is relieved by a discharge through an unwonted channel. That the menstrual discharge has its true source in the mucous membrane which lines the cavity of the uterus is a fact which admits of no doubt, and has been proved to demonstration, by examination of the uteri of women who have died during a period; by accumulation of blood within the cavity in cases of atresia of the cervix or of the vagina; and, finally, by the examination of cases of chronic inversion of the uterus, which offer peculiar facilities for the study of the subject.

In our review of ovulation, those of the essential phenomena of the process which have their seat in the uterus and its lining membrane, were left for consideration at this place. In point of fact, we may assume that menstruation itself is essentially one of these phenomena, which are mutually dependent on each other. Along with the enlargement of the ovary and Fallopian tubes already described, a very considerable enlargement, involving an increase in weight, takes place in the uterus. Its vascular apparatus becomes developed and injected in an unusual degree. This is especially marked in the case of the mucous membrane, on the surface of which, under the epithelium, the vascular network already described becomes very distinct where the vessels surround the orifices of the utricular glands. The glands themselves are also

which now, under the special circumstances, become patent, and which, the apogée of the period having passed, forthwith commence to close, to open afresh on the approach of the next menstruation.

The theory, however, which perhaps of all others has attracted in recent times the greatest amount of attention, is that which is associated chiefly with the name of M. Pouchet, a very distinguished and able physiologist, although one who is rather addicted withal to jumping at conclusions. To this theory some of the ablest of our English writers have given their adhesion. Pouchet supposed that the whole, or the greater part of the mucous membrane (not the epithelium merely) is shed at each catamenial period; and that its separation from the subjacent tissues involves the rupture of vessels, whence the menstrual flow. This, however, would involve, as will at once be noticed, a very different appearance of the internal surface of the uterus, from that which has been above described as occurring at this time, and which we believe to be substantially correct. A separation of a membrane so thick and so important as this, would, in fact, be capable of obvious anatomical demonstration; and if it could be so demonstrated, we would at once have, in the trunks of the vessels which must of necessity be ruptured, the source, clear and unequivocal, which we are endeavoring to trace. The separation of the whole mucous membrane of the uterus, under the name of *decidua*, which always occurs as we shall see in women at the moment of delivery, and the occasional occurrence of what is known as membranous dysmenorrhœa, when, in certain morbid conditions, the whole membrane is actually exfoliated, and shed either piecemeal or entire, are facts which have seemed to M. Pouchet sufficient to establish an analogy, on which, mainly, his theory is based. The mucous membrane, he says, is deciduous not merely at the termination of pregnancy, or as a consequence of an exceptional morbid action, but at each menstrual period. No such separation takes place in the lower animals, and in this distinction we find revealed at once the source of the menstrual discharge, and the reason why, in the human species, hemorrhage is superadded to the ordinary phenomena of "rut." Ingenious as this theory may be, and interesting as the facts undoubtedly are which its promoter has brought to bear upon it, it is one, we think, which does not bear well a closer investigation.

If M. Pouchet could show us the exfoliated membrane, and the raw, bleeding surface which its removal necessarily involves, as he might do in membranous dysmenorrhœa, or in women who have died shortly after delivery, his theory would be established, and the question forever set at rest. But in this he has completely failed. Opportunities of examining the bodies of women who die during a menstrual period are, no doubt, rare; but a sufficient number of such examinations have been made by Coste, and by others who, like him, have faithfully and elaborately recorded their results, to show what is the usual condition of the parts. In a certain number of cases, no doubt, partial or complete exfoliation does occur, but even Pouchet himself is forced to admit that these cases are exceptional. But what does he do now? He propounds, *more suo*,—a new theory, according to which the membrane is held to desquamate, not during menstruation, but in the

observed, in an injected uterus, that the capillary vessels, which form so fine a network upon its inner surface, are "denuded and hanging forth in detached loops." Such observations as these, taken along with the fact that epithelial cells, and a certain amount of débris, are found mingled with the catamenial discharge, suffice, we think, to prove that, during menstruation, the flow of blood is from the mucous membrane of the cavity, and that certain changes in, and probable loss of the epithelium, are associated with the flow. As regards the manner in which individual blood-corpuscles escape from the tubes in which they are contained, we must be content for the present to remain, in a measure, ignorant, as none of the theories hitherto advanced have, up to this time, been proved to be correct.

The menstrual, or childbearing epoch of a woman's life, ranges on an average from twenty-five to thirty years, ceasing between the ages of thirty-five and fifty. So long as the woman enjoys perfect health, the appearance of the discharge should be at regular intervals, of which the normal duration is twenty-eight days. Many women, however, as is well known, menstruate every three or every six weeks, and we are only justified, practically, in looking upon such cases as abnormal, when the general symptoms are such as to call for interference. Irregularities occur, too, as we have already seen, frequently enough during the first months of menstruation; and we find also that, as the catamenial climacteric or change of life approaches, the cessation of the menstrual function does not occur abruptly, but after marked premonitory symptoms. At this period of her life, a woman becomes subject to many hysterical and other minor ailments, from which she may previously have enjoyed an entire immunity. A period may, possibly for the first time, pass without discharge. On the next occasion, an increased quantity seems as it were to compensate for the omission which nature had made. Intervals of longer duration may now succeed, intervals which bear no relation to former menstrual epochs, until after a certain number of fitful and capricious efforts on the part of the uterus to relieve itself as before, the catamenia finally cease; the uterus alters its condition to that which it presented in early life, and the ovaries shrink so rapidly, that they become wrinkled in their external surface, so as to resemble, as Raciborski says, the kernel of a peach. The only normal exceptions to regular menstruation are pregnancy and lactation, but even these are by no means regular in their occurrence, as we occasionally meet with cases where women continue to have their periods for some time after conception, and frequently with others where, during lactation, menstruation goes on with perfect regularity. Any menstrual irregularity, however, occurring during that period of a woman's life which we are here considering, and independent of pregnancy, is to be looked upon as an abnormal state, which calls for treatment with a view to the maintenance of her health. These, and other menstrual disorders, constitute a class of diseases to the treatment of which the physician has constantly to address himself.

The cause of menstruation is a question which has given rise to a great deal of useless discussion, and to not a few baseless theories.

to be essential is contact of the seminal fluid with the pudendum, which is further proved by observations of pregnancy coincident with perfect hymen.

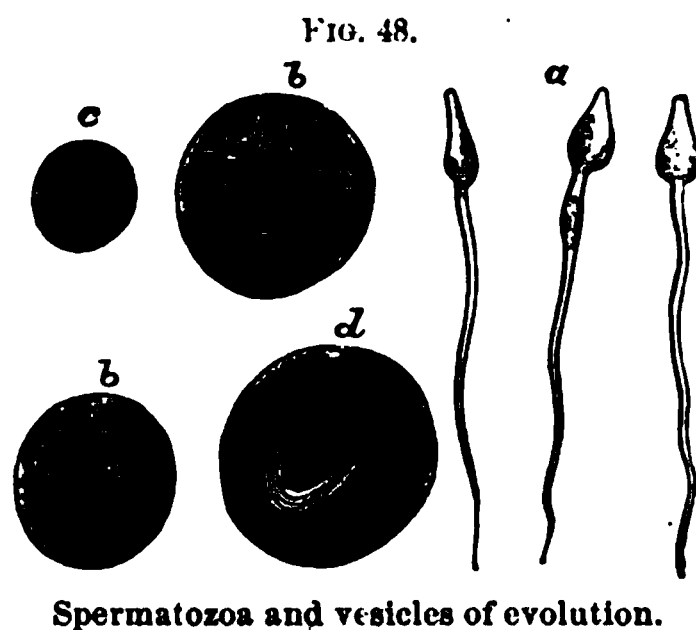
The semen is a thick, glutinous, whitish fluid, albuminous, heavier than water, and emitting a peculiar odor. If subjected to examination by a considerable magnifying power, it is found to consist of a number of little oval, flattened bodies, which in man are not more than $\frac{1}{800}$ of an inch in width, furnished with long filiform tails, which taper gradually to the finest point. A lashing undulating motion is imparted to these bodies, for a certain time after death or ejaculation, varying according to circumstances from several hours to several days. This brisk and constant movement, which has led Köl liker to compare them to ciliated cells, gave rise to the erroneous opinion that they were animalcules—hence the name which they still retain, *Spermatozoa*.

Besides these bodies, there are observed certain minute round and granular masses, varying in number, but always fewer in ripe semen than the Spermatozoa themselves. These are what were originally termed by Wagner, "seminal granules," but which have been shown by his subsequent researches, and by those of Köl liker, Leuckardt, &c., to be cells within which the Spermatozoa are developed, and are now termed *vesicles of evolution*. These again are generally found to be in-

closed in groups of from three to seven within parent cells (Fig. 48, *b b*), but each vesicle of evolution is destined for the development of a single spermatozoon, as is shown in a mature specimen at *c*. The individual spermatozoa escape thereafter by rupture of the containing vesicle, and may now (*a*) exhibit their characteristic movements. Sometimes, rupture of the vesicles of evolution takes place without absorption of the parent cell, when the appearance produced is that shown at *d*, where a bundle of spermatozoa is seen, their number corresponding to that of the original vesicles. It is only, it may be observed, by a careful examination of the semen in the testes, epididymis, and other portions of the tract, that these several stages may be traced. These elements of the semen are found to float in a limited quantity of clear perfectly homogeneous liquid. Direct experiment on the ova of the Amphibia has proved that it is in the spermatic particles and not in this fluid that the fecundating principle resides. If the spermatozoa are absent, therefore, as in debility, disease, or old age, impregnation is impossible, and it is their absence in the semen of hybrids that renders these animals sterile.

The Ovum, at the stage at which we left it, was escaping, or about to escape, from a ripe Graafian follicle. It is then composed of the following parts (see Fig. 39, p. 77):

a, Of a thick transparent membrane, which completely surrounds



fluid and the secretion of Cowper's glands, and, subsequently, with the vaginal and uterine secretions, are obviously circumstances which tend to preserve the spermatozoa, by furnishing a medium in which they may freely float: an absence of these conditions would necessarily curtail their vitality. Although we may assume it as an established fact that impregnation *may* occur in the ovary, it by no means follows that it can occur nowhere else. But it is certain that the contact between the male and female elements must almost always take place, if not in the ovary, at some point between it and the upper third of the uterine cavity. Bischoff affirms that, by the time the ovum reaches the lower end of the Fallopian tube, its capacity for impregnation is lost, and experiments which have been made, by tying the Fallopian tubes in the lower animals before copulation, so far corroborate this view.

How, then, do the spermatozoa reach the ovum? It cannot for a moment be doubted that the spermatozoa must make their way upwards in Man, as in the lower animals, from the vagina, to that point where they meet the ovum.¹ This movement may be effected by various agencies: 1st. By the motion of the spermatozoa themselves, which may undoubtedly determine a motion, although it is difficult to conceive why such motion should be in a definite direction. It is highly improbable, therefore, that this is the sole motive power. 2d. By the action of the vibratile cilia. This will account, no doubt, for the movement from the middle of the cervix upwards, but in cases where impregnation has resulted from contact without penetration, the absence of cilia between the vulva and the cervix must leave the movement along this part of the tract to the operation of some other agency. 3d. Muscular peristaltic contractions may also act by propelling the semen in a definite direction. There are various parts of the course which the semen must traverse, to which one or other of these forces may be more applicable, but it is more than likely that all these act more or less in unison, with a view to securing the contact, without which no conception may possibly occur.

The absence of the vibratile cilia during a menstrual period may raise a difficulty as to the acceptance of one of the above theories, most likely to suggest itself to those who entertain the strongest views as to the identity of the rut and menstruation. But, in regard to this, it must be observed, that the period at which impregnation is most likely to occur is immediately before, or some days after, menstruation; in the one case, the changes in the epithelium of the uterine mucous membrane not having yet commenced, and, in the other, a sufficient period having elapsed to admit of its reparation. Another channel through which, in exceptional cases, the spermatozoa may work their way up, is one which, on the authority of Mauriceau, De Graaf, and Baudeloque, Cazeaux assumes to result from a bifurcation of the Fallopian tube near its uterine extremity, the new canal passing through the uterine walls, and opening near the internal os. As modern anatomists make no mention of such a canal, we may assume its existence to be doubtful;

¹ Some speak of the "ovum" only after impregnation, and term it "ovule" prior to this.

and even if we admit it, its only physiological importance would be the possibility of the arrest of the ovum there, and the formation of what has been called by the older writers "Graviditas in substantiâ uteri."

A sketch of the development of the ovum, from the period of impregnation onwards, will be reserved for the following chapter.

CHAPTER VI.

DEVELOPMENT OF THE OVUM.

FORMATION OF THE EMBRYO-CELL—CLEAVAGE OF THE YOLK—DEVELOPMENT OF THE BLASTODERMIC VESICLE—"SEROUS" AND "MUCOUS" LAYERS—THE AREA GERMINATIVA AND PRIMITIVE TRACE—FORMATION OF THE EMBRYO; OF THE UMBILICAL VESICLE AND OMPHALO-MESENTERIC VESSELS; OF THE AMNION; OF THE ALLANTOIS AND UMBILICAL VESSELS; OF THE CHORION—THE LIQUOR AMNII—THE VITRIFORM BODY—THE DECIDUA; WHAT IS IT?—DECIDUA VERA; REFLEXA; SEROTINA—EARLY CONNECTION OF OVUM WITH DECIDUA—THE UMBILICAL CORD: VESSELS: GELATIN OF WHARTON, ETC.—KNOTS ON CORD—THE PLACENTA—IN BIRDS; IN NON-PLACENTAL MAMMALS: IN RUMINANTS: IN MAN: MATERNAL AND FŒTAL SURFACES OF: MATERNAL CIRCULATION IN: CURLING ARTERIES: SINUSES: VEINS—FŒTAL PORTION: ARTERIES: TUFTS OR VILLI: VEINS—FUNCTIONS OF THE PLACENTA—STRUCTURE OF VILLI.

THE development of the ovum in the Mammalia, and especially in Man, is, as regards its earlier stages, a subject still involved in no little obscurity. The magnificent results which have sprung from the studies in comparative physiology, associated with the names of Bischoff, Kölliker, Allen Thomson, Rathke, and many others of scarce inferior merit, enable us, with a certain amount of confidence, to fill up gaps in an account of human development, which the very rare opportunities afforded of examining human ova would probably never have revealed, but which the application of strict analogical reasoning enables us to supply. On these principles the following sketch is based. No attempt will, however, be made to follow the development of individual organs; but merely to indicate, in what appears to the writer to be the simplest possible manner, the mode in which the envelopes of the embryo are evolved, and the provision which, in successive stages of growth, is made for its nutrition.

The disappearance of the germinal vesicle is one of the earliest changes which has been observed, but this is not necessarily associated with impregnation. The formation, however, in its place, of the new *embryo cell*, which, having been demonstrated in many animals, is assumed to take place also in the human species, and the changes which immediately occur in the yolk, are undoubted results of the fecundating process, and of the penetration of the walls of the ovum by the spermatozoa. In the outer half of the Fallopian tube, the ovum

is believed to have already undergone some of these changes. There can be little doubt, at least, that, even thus early, the germinal vesicle and its spot can no longer be distinguished, and the external surface of the ovum is still covered with some of the granulations in which, within the Graafian vesicle, it was imbedded. The zona pellucida is somewhat thickened, and the embryo cell is probably formed. The yolk becomes more compact, and, as it were, condensed. In the inner half of the tube the granulations have disappeared, and their place is occupied, on the external surface of the ovum, by a thin albuminous layer, which is analogous to the white of the egg in birds. This albuminous layer, like the subjacent zona pellucida, becomes, in the first instance, thicker, and there now commences that most remarkable series of changes preparatory to the formation of the embryo, known as the *segmentation, or cleavage of the yolk*.

The first step in this process consists, as is shown in Fig. 49, of the fission of the mass of the yolk into two equal portions, by a deep furrow on either side, which ultimately, by uniting in the centre, completes the division. These again, by a repetition of the process, become subdivided, so that four spheres are now observed to occupy the cavity of the zona pellucida. Each of these divisions of the yolk proceeds, *pari passu*, with a corresponding duplication of the "embryo cell," already referred to. After precisely the same fashion the spherules

FIG. 49.

FIG. 50.

FIG. 51.

Successive stages of the cleavage of the yolk.

become still further subdivided into 8, 16, 32, 64, and so on, until, on the arrival of the ovum at the uterine extremity of the Fallopian tube, the yolk presents the appearance shown in Fig. 51, which has been well compared to a mulberry. It is from this *germ mass* that the whole organization of the embryo is gradually evolved. Professor Owen is of opinion that the whole of these cells are not used up in the development of the individual, but that a certain number are retained for the formation of the ovaries or testes, and that, low in the animal scale, as in the Amphibia, special provision is also made, from this source, for the reproduction and repair of limbs which have been injured or lost. The albuminous layer, which has become of very considerable thickness, is now gradually absorbed, and ultimately disappears.

Having arrived in the uterine cavity, the ovum, on examination, appears as if the whole of the granular germ-mass had been absorbed. And to some extent, no doubt, a process of solution or absorption has taken place, the centre of the cavity being again occupied by a fluid which is limpid and transparent. A more careful examination shows,

however, that a large proportion of the granules become condensed towards the inner surface of the zona pellucida, assuming the form of true cells, of a hexagonal or pentagonal appearance from the pressure which they exercise upon each other. While these changes are going on, a rotatory movement of the yolk takes place, during which, possibly by centrifugal attraction, the cells retreat from the centre towards the circumference, and ultimately form a new membrane. This spheroidal vesicle within the zona pellucida, is the structure out of which, step by step, the entire embryonic structures are evolved. It is the *blastodermic vesicle* of Bischoff and Coste.

From the shape of the cells of which it is originally composed, the ovum now presents the appearance shown in Fig. 52, which indicates

FIG. 52.

External surface of the ovum, showing the area germinativa.

also a considerable increase in size, owing to the rapid augmentation of its fluid contents by absorption from the uterus, and the simultaneous development of the blastodermic vesicle, which now exhibits great and independent vital energy. At one point of its surface a certain number of the original segmentary masses and cells form, by their aggregation, the appearance which is represented in the same figure. This, which is at first round, and subsequently becomes oval, is recognized by its whitish opaque appearance. It is called the *area germinativa*, and constantly in-

creases in size by the development of fresh cells, and by and by splits into two layers, a division which rapidly extends throughout the whole blastodermic vesicle. The external of these two layers was originally called the "serous," the internal the "mucous" layer. As our object is to enter upon this subject, only in so far as is essential to a knowledge of the points in development which are of special obstetric interest, we shall here refer to these two layers only. There is another layer, however, intermediate between the two, which further subdivides as evolution advances, a knowledge of which is essential to a thorough description of the various organs. This was first called the "vascular" layer, but there are many points in reference to it which are still under consideration, and in a measure involved in obscurity. This seems to us to be an additional reason why, at the risk of trifling inaccuracy here and there, we should not enter upon the difficult subject of the intermediate layer.

The Area Germinativa, at first homogeneous in appearance, soon shows in its centre a clear space, called the *area pellucida*, bounded by a denser layer of cells, which are manifestly more opaque. The first appearance of definite embryonic structure is a shallow groove lying lengthwise in the area pellucida. This is the *primitive trace*, the earliest indication of the cerebro-spinal canal. If viewed in section, this groove

(Fig. 53 *a*) is seen to lie between two lateral eminences called the *laminæ dorsales* (*c c*) which we here demonstrate, as it illustrates a law in development, of which, in the evolution of special organs, we find many illustrations. This diagram, after Carpenter, is the only one in



Diagram showing the earliest formation of the embryo.

the series in which the middle layer is indicated, showing at *a* the first trace of the vertebral column, and at *p p* the subdivision of this layer, indicating the origin of the pleuro-peritoneal cavity. The lowest in figure, is the mucous layer. In the development of the tube of which the groove is the trace, the *laminæ dorsales* rise, and, folding together, meet in the middle line and there unite. Consequently, the cutaneous or corneal layer (*Hornblatt* of Kölliker) secretes from a portion of its surface, elements which, within the tube, ultimately become the cerebro-spinal nervous centre. Among other instances of this method of development by involution, the formation of the lens and vitreous body, in the construction of the eye, is a striking example, both the skin and these structures being originally portions of the same external or corneal surface.

The albuminous layer having now disappeared, and the *zona pellucida* having in great part lost its thickness, the formation of the embryo becomes more distinctly manifested by a rolling or folding inwards both of the sides and of the extremities of the *area germinativa*. At this stage, the embryo has the appearance of a curved gutter, with a larger (cephalic) and a smaller (caudal) extremity. A glance at the diagram (Fig. 54) will show that its external or epidermic surface is continuous with the external or serous layer (*s*) of the blastodermic vesicle. About this period, the blastodermic vesicle becomes divided

FIG. 54.

FIG. 55.

Diagram showing early stage of development.

Further development of the ovum.

into two parts, as is indicated by the horizontal dotted line in this and the following diagram, the lower portion being *embryonic*, and the large cavity above forming the *umbilical vesicle* (*u*). The embryonic portion constantly increases, while the umbilical vesicle progressively diminishes, as if the development of the former took place at the expense of the latter: this is made clear in the series of diagrams. The two small projections (*a a*) show the earliest stage of the formation, by a process of involution, of the *amnion*, an important foetal structure, the devel-

allantois on its internal surface. The Chorion, thus constituted, becomes abundantly supplied with vessels from the allantois, which soon pervade it in its whole extent, as is shown in the accompanying diagram (Fig. 57). Prior to this, small projections have appeared on the external surface of the chorion, which are the rudiments of the long shaggy villi with which the ovum is seen to be covered in abortions

FIG. 56.

FIG. 57.

a a

Development in a more advanced stage.

Completion of the amnion, and formation of the umbilical cord.

occurring in the early weeks of pregnancy. The allantois having now fulfilled its function, dwindles to a mere cord, within which a minute vesicle may be detected by careful examination, as representing the original cavity. It is probable that the allantois forms about the tenth day after impregnation, and runs its course in a few days more; so that it is not to be wondered at, that some physiologists have doubted its existence in the human race, seeing that it has never been demonstrated. Analogy, however, enables us confidently to assume that, without it, there could be no vascularity of the chorion, a condition which would involve a speedy arrest of development. At first, it carries two arteries and two veins; but the vein of the right side becomes obliterated about the fifth or sixth week, so that there are found from this period till the time of birth, two umbilical arteries and one umbilical vein.

After the formation of the allantois, the umbilical vesicle rapidly shrinks, and is often seen, in abortions at the sixth week, under the form of a vesicle no larger than a pea, connected with the embryo by means of a long and narrow pedicle. (See Fig. 71.) The omphalo-mesenteric vessels atrophy, along with the organ to which they belong, and the communication which existed between the vesicle and the alimentary canal, becomes more and more curtailed, and ultimately obliterated. There can be no doubt, however, that in the earliest stages of the development of the ovum, and up to the period of the formation of the allantois, the embryo derives its chief nourishment from the whitish yellow fluid which is contained in the umbilical vesicle, and which has been found to contain numerous fatty cells and

aperture in its sheath, and it is in this way that the vesicle ultimately comes to lie *between* the chorion and the amnion, as will be more clearly demonstrated in the illustrations which follow. The closure of the amnionic cavity, the formation of the allantois, and the connection thus ultimately established between the embryo and the exterior of the ovum, complete the essential parts of the ovum. The latter now consists—

- a. Of the Embryo.
- b. Of the Liquor Amnii, in which it is suspended.
- c. Of the membrane of the Amnion, which is the internal membrane of the ovum, and which forms a sheath to the umbilical cord. The pedicle of the umbilical vesicle passes through an aperture in this sheath.
- d. Of the Urachus or pedicle of the Allantois, and other parts which, together, form the Umbilical Cord.
- e. Of a space between the amnion and the chorion, containing the vitriform fluid and the Umbilical Vesicle.
- f. Of the Chorion,—the external envelope of the ovum.

These parts, although their development is due, in some measure, to maternal influences and material, may be termed embryonic. Other structures are, however, being simultaneously developed, which may be regarded as in whole or in part maternal.

The outermost of the three coverings of the ovum, one which, according to every hypothesis hitherto advanced, must be looked upon as purely maternal in its origin, is the *decidua*. The theory originally propounded by Hunter, and adopted by the great bulk of physiologists down to the time of Coste, was simply this: That the congestion and excitement coincident with impregnation, caused, on the inner surface of the uterus, an exudation of a new formation of the nature of coagulable lymph, which closed the orifices of the Fallopian tubes, leaving only one opening, corresponding to the internal os. The ovum, on its arrival in the uterine cavity, was assumed to push this membrane before it, so that the decidua became naturally divided into two parts, that which adhered to the uterine surface (*decidua vera*, a), and that which invested the ovum (*decidua reflexa*, b). Subsequent observation having shown that a portion of membrane, identical in its structure with these, was found behind the ovum,—between it and the uterine wall,—this was regarded as a formation subsequent to the arrival of the ovum, and was named the *decidua serotina*. This ingenious theory owed its general acceptance to the fact, that it afforded a complete and rational explanation of what had frequently been observed in abortions—that the complete ovum was found to be inclosed in a pouch, which was shed from the uterus, and which thence derived its name. The theory universally adopted by modern physiologists is, however, quite different from this.

We have already seen, in our notice of the mucous membrane of the uterus, as observed in women who have died

FIG. 58.



Diagram, showing Hunter's theory as to the formation of decidua.

invariably the vein forms as it were a centre or axis, around which the arteries are arranged in an irregularly spiral form. This twisting, which has been observed as early as the second month, is supposed to depend partly upon the movements of the foetus, and partly upon a more rapid growth of the arteries than of the other tissues of the cord. On an average, the cord is about the thickness of the little finger. Many anomalies have been observed in the formation of the cord. One artery, three arteries, and even three veins, have been met with without anything untoward having occurred, in any stage of the case, in the course of pregnancy.

When the cord is too long, knots have frequently been observed upon it. These are, doubtless, due to the movements of the foetus, and are much more likely to occur if, along with great length of the cord, there is an excess of the liquor amnii. It is easy to understand how, under such circumstances, the foetus might float through a large loop, and a knot be the immediate or ultimate result. It is conceivable that danger might arise from this, in the course of labor, should any mechanical complication tend to draw the knot tighter; but all experience seems to show that these knots are not to be looked upon as dangers, unless under such very exceptional circumstances.

The cord is of very considerable strength, as a general rule, as is shown in cases where—often in error—considerable force is brought to bear upon it, in attempts to remove the placenta when this organ is retained. At other times a very moderate tension will suffice to break it. It is firmly adherent, at its foetal extremity, to the abdominal walls of the child, and, at the placenta, it is found to be intimately connected with the tissues of the chorion. Externally, its connection with the amnionic sheath is of a slighter character, and this is more particularly to be observed near the placenta, where the amnion often passes off from it near the point of its insertion, and thus forms a sort of infundibuliform investment, which has been noticed by many authors. Nerves and lymphatics have been described as appertaining to the umbilical cord, but these, if present, are so difficult to trace that their existence is very generally doubted.

The Placenta.—The ovum is, as we have seen, supplied with nutriment, in the first instance, directly from the contents of the umbilical vesicle through the channel of communication which exists between it and the intestinal canal; subsequently, in all probability, through the medium of the omphalo-mesenteric circulation; and, at a still later period, before the formation of the allantois, through the villi of the chorion by imbibition. When, through the agency of the allantois, the umbilical vessels have been projected to the walls of the ovum, a more direct means of communication is at once established. In the lowest mammalia, which are hence called “non-placental,” no further change takes place in this respect—the whole periphery of the chorion exchanging elements with the maternal parts, as in the early human ovum—until the period of birth. In many of the higher mammalia, as in the Ruminants, certain portions of the surface of the ovum contract with the superimposed maternal parts more intimate adhesions, while other parts become comparatively deprived of their villi. An

increase of tissue at these points gives rise to the formation of "cotyledons," which may be looked upon as so many miniature placentæ. In Man, however, and the higher orders, these are confluent, or rather are concentrated at one spot, and thus form the single connective organ which is known as the placenta.

The disappearance of the villi over the remaining portion of the surface of the chorion, concentrates within the new organ the functions of nutrition and respiration, which it has thenceforth to discharge. A study of its structure is of peculiar interest to the obstetrician, as any diseased or other condition which may influence the due performance of its functions must necessarily exercise an important influence on the healthy and normal development of the embryo. In many of those animals in whom a placenta exists, that portion which is derived from the ovum may be readily separated from the part which is of maternal origin; but, in the human placenta, no such separation is in any way possible, so intimately are the two elements incorporated together. We must, nevertheless, look upon the placenta as composed originally of two distinct parts or layers, which are accordingly named the *maternal* and *fœtal* portions of the placenta.

The maternal portion is developed out of that part of the uterine mucous membrane to which the ovum attached itself on its arrival in the uterus. In other words, it is the decidua serotina. No sooner has its formation commenced, than the bloodvessels in the corresponding region of the uterus become notably enlarged, the arteries retaining their characteristic spiral form, while the diameter of the venous trunks becomes so much increased, that they are now called sinuses. The vascularity of the decidua serotina thus becomes greatly augmented. On the other side, or fœtal portion, the chorion and its villi become enormously hypertrophied, and the umbilical vessels permeate its tissue throughout. It must not be supposed, however, that in the developed human placenta there is any line of demarcation between the two portions of the placenta, at which the vascular system proper to each is walled in; on the contrary, throughout the whole of its structure, the maternal and fœtal vessels are intimately commingled, and yet to their uttermost subdivisions essentially distinct. Numerous observations have proved this, but none more distinctly than the experiments of Bonami, to which we shall immediately refer. Before doing so, however, it is necessary to observe that, on separating a placenta from its uterine attachment by cautiously drawing the parts asunder, it becomes obvious that a special tissue intervenes. This has been described as separating into two thin gelatinous layers, consisting when *in situ* of interlacing lamellæ, adhering at certain points only of their surface, and thus forming cells which may be shown on gently drawing the parts asunder. This is the *inter-placental* or *inter-utero-placental* tissue.

Bonami demonstrated so far the structure of the placenta by colored injections as follows: He injected—

1st, *Red*, from the iliac and ovarian veins:

2d, *Blue*, from the uterine arteries:

3d, *White*, from the umbilical vein:

4th, *Yellow*, from one umbilical artery, the other being tied to pre-

work, but the general views of the case, as adopted by the best authorities, may here be briefly epitomized. The vessels which are seen to pass through the utero-placental tissue are, with an important exception to be noticed afterwards, of two kinds, arteries and veins. The former, the "curling arteries" of the uterus as they are generally called, are of moderate size; they do not anastomose much, nor are their ramifications very numerous, and they retain, within the placenta, in a certain degree their spiral disposition. The veins are somewhat larger, straight in their direction, and with numerous anastomoses. Some have supposed that the connection between these veins and arteries was of the nature of a simple capillary circulation, but the researches of Reid, Weber, and Goodsir, have shown that their connection is of a special character, and offers the strongest possible contrast to a capillary system. According to them, the blood is conducted by the curling arteries into large irregular cells, or *sinuses*, the walls of which are thin, and composed of the lining membrane of the maternal vascular system only. These sinuses communicate freely with each other, and from them the blood is returned to the uterus through the veins which are seen to pass through the utero-placental tissue. In fact, a considerable portion of the bulk of the placenta, when the organ is replete with blood, is said to be composed of a great venous cavity, which dips so deeply into the chorion as to attain its foetal surface, but which is more distinctly seen in the tissue of the decidua. A large coronary vein has been described by Jacquemier and Meckel, as existing near the margin of the placenta. It is, they say, rarely complete, but presents in its course frequent interruptions, where the continuity is maintained by subdivision and anastomosis; but as their observations on the subject have not been confirmed by recent research, we may assume that the existence of such an arrangement is doubtful, certainly not constant. It is proper to add that the presence of a great venous cavity within the placenta has quite recently been seriously called in question.

On the foetal side, the vessels, on reaching the placenta, divide at once into large branches which are distinctly seen through the amnion. If this membrane be detached, which may easily be effected, as shown in the upper part of Fig. 62, both arteries and veins are observed to divide on the surface of the chorion. They then subdivide again and again, always dichotomously, and plunge into the thickness of the lobes. Here the arteries communicate freely with each other, so that if we inject one umbilical artery, the injection will return by the other. If, however, we tie the other, a successful injection will return into the umbilical vein, while the color of the injection will be observed on the uterine surface of the placenta. If we trace the arteries to their ultimate ramifications, we find that they are divided into innumerable tufts, fringes, or *villi*, which form in fact the bulk of the foetal placenta. Each tuft is occupied by one or more capillary loops, and the current after passing through these loops, returns by the affluent canals, forming by their union the umbilical vein. The vessels of this capillary system differ from other capillaries in their greater size, their calibre being such as to admit of several blood-corpuscles passing

also, material is supplied for the building up of the foetal tissues, and effete matter is removed. The observations of Goodsir on this point, which are of the greatest possible interest, are corroborative of the views of Reid. These will be noticed when we come to speak of the nutrition of the foetus.

The formation of the placenta commences in the latter part of the second month, and within a few weeks it acquires its essential characteristics. Small bloodvessels, for the special nourishment of the organ, pass from the uterus, but neither nerves nor lymphatics have been traced.

CHAPTER VII.

DEVELOPMENT OF THE EMBRYO AND FŒTUS.

DEMONSTRATION OF EMBRYONIC STRUCTURES—CHARACTERISTICS AND DEVELOPMENT OF THE FŒTUS AT THE TERMINATION OF EACH MONTH OF PREGNANCY, FROM THE THIRD ONWARDS—DIMENSIONS OF MATURE CHILDREN—OF THE POSITION AND ATTITUDE OF THE CHILD IN THE WOMB—CAUSES OF CRANIAL PRESENTATION: THEORIES OF ‘PHYSICAL GRAVITATION,’ ‘VOLITION,’ AND ‘REFLEX ACTION’—THE FŒTAL CRANIUM: SUTURES: FONTANELLES: DIAMETERS—DEFINITION OF THE TERM ‘VERTEX’—FUNCTIONS OF THE FŒTUS: CIRCULATION: RESPIRATION: NUTRITION: SECRETION.

THE term Fœtus is, according to usage, not applicable to the product of conception, until the termination of the third month of gestation. Till then it is termed the embryo. A study of the formation of the various embryonic structures is a subject which, in so far as human development is concerned, is beset with many difficulties. Viewed, however, in the light which comparative physiology has thrown upon it, our knowledge of the various organs of which the individual is composed, and of their growth from primal elements, may be considered as tolerably complete. The opportunities which arise of examining the bodies of women who die in the earliest stages of pregnancy are so few, that a very peculiar interest attaches to the few reliable descriptions and representations which have hitherto been made. Among these, none perhaps have received more unqualified commendation than the well-known drawings of Coste, from which the representations which follow have chiefly been taken. To attempt a demonstration, or even a narrative of the development of individual organs, is only suitable to a systematic treatise on Embryology. A very superficial description will serve our purpose here, and may suffice to show, more clearly than is possible by any means other than actual dissections, the relations which the various parts of the ovum bear to each other, and to the maternal structures with which they are in contact.

clearly shown. The umbilical cord is opened in its whole extent to show its contents, including the canal of the urachus (pedicle of the

FIG. 68.

allantois), which extends from the caudal extremity of the alimentary canal, closely accompanied by the umbilical vessels, and terminates at *w* in a cul-de-sac. On either side are the umbilical arteries and veins, the arteries springing from the lower part of the aorta, and the veins passing upwards, to unite before entering the liver and mix their contents with the general circulation, at the point of confluence (*o*), beneath the heart. The vein of the left side, which may be observed passing through the centre of the mesentery, is the permanent one, and is already much larger than its fellow of the right side, which has been cut across at *pp*. The heart (*h*), with its four cavities and the aortic bulb, is separated from the liver by an imperfect diaphragm. The Wolffian body of the right side (*w*), is shown passing from the heart to the inferior extremity of the intestine. Along its outer margin runs its excretory duct, which opens, along with its fellow of the other side, into the cloaca behind the rectum. The greater relative size of the cephalic extremity of the embryo is a striking peculiarity which at once attracts attention. The rudimentary eye (*a*) is remarkable, chiefly in respect of its lateral position. In front of it is the right nasal fossa, and below it, at *e*, is the earliest trace of the internal ear. The large bucco-nasal cavity, with the three branchial arches beneath it, also attract special notice.

The same embryo, further dissected.

Fig. 68 shows the same embryo magnified eleven times, carefully dissected, and seen from before. A portion of the intestinal convolution and of the mesentery has been removed, along with the anterior thoracic and abdominal walls, and the umbilical cord, so as to bring into view the most of the Wolffian bodies on each side, and the heart.

This representation shows more clearly the lateral position of the eyes (*a*), and the distance between the nasal fossæ (*f*), which are seen to communicate with the buccal cavity by a simple furrow. Between *a* and *f* are the rudiments of the superior maxillary bones. There is complete absence of all trace of palate. The position of the auricles, ventricles, and aorta, and the relation which these parts bear to each other at this age, are also more obvious from this point of view. Hidden to some extent by the heart, and separated from it by an incomplete diaphragm, is the liver (*l*), which is of equal size on the right and left side, and presents a fissure on its lower surface: it covers and conceals the stomach. The vessel which is seen in section within this

orifices of the Fallopian tubes were, as well as that of the cervix, perfectly permeable, which was proved in the clearest manner by the observation of the orifice of the left tube, through which the ovum had passed on its way to the uterus." In order to demonstrate the structure and relation of the parts, a circular incision was first made through the decidua reflexa, and the flap thus formed was turned down towards the internal os. On its inner or everted surface (*d*), the lacunæ are seen, which have already been described as existing at this period of pregnancy for the reception of the villi of the chorion. The ovum itself was then opened by a crucial incision, and the flaps of the chorion (*c c*) turned aside, so as to show the amnion (*a*). Through the walls of the latter membrane, the embryo is seen floating freely in the liquor amnii. The short and thick umbilical cord is observed passing from its ventral surface to that part of the surface of the chorion where the placenta would afterwards have been found. The situation of the umbilical vesicle in the cavity between the chorion and the amnion (a point which the student has occasionally some difficulty in understanding) is here very satisfactorily shown, and also the long pedicle which penetrates the umbilical cord, and through which communication with the intestinal cavity of the embryo is still for a time kept up. The amnion is not yet of sufficient size to fill the cavity of the chorion, which still contains the vitriform substance (*magma réticulé* of Velpeau). This substance gradually disappears as the ovum increases in size, becomes compressed, and ultimately is reduced to a layer of extreme thinness when the amnion and chorion come into contact, when all trace of the umbilical vesicle disappears.

After the development of the placenta is completed, and the villi of the free surface of the chorion have been absorbed (as some suppose, by a process of fatty degeneration), not only does the cavity between the chorion and the amnion disappear, but that which exists between the decidua vera and the decidua reflexa is also gradually encroached upon by the growth of the embryo. When these membranes finally adhere, that cavity, too, is obliterated; and now, for the first time, the product of conception may be said to occupy the whole cavity of the uterus. These changes are completed in the course of the third month.

At this period, the foetus measures in length from five to six inches, and weighs about four ounces; and the development of its limbs and other parts has advanced to such an extent, that the external parts may be said to be completely formed. The head, although still, relatively, of great size, is so in a much less degree than at an earlier period. The various cavities are completely closed. The formation of the palate, and the completion of the superior maxillary bones, has divided the bucco-nasal cavity. The branchial arches have disappeared as early as the fifth week, with the exception of one fissure, which has developed into the external ear. The umbilical cord is already longer than the embryo, has assumed its characteristic spiral form, and is attached considerably below the middle point of the vertical measurement of the child. Previous to this, a loop of intestine occupied a portion of the cord, but this is now included, by contraction

of the umbilicus, within the abdominal cavity. When that condition is permanent, umbilical hernia is the result. The globe of the eye is seen through the eyelids, and the pupillary membrane may be seen filling up the aperture of the iris. The nails have commenced to form, but are very thin, and almost membranous. The sexes are distinct.

At the end of the fourth month¹ the length of the fœtus will be found to have increased to from $6\frac{1}{2}$ to $7\frac{1}{2}$ inches, and its weight to nearly 9 ounces on an average. On examining the head, the fontanelles are found to be of great size, and the sutures apart. Hair makes its appearance on the scalp, in the form of a slight down, which may also be noticed, in a still more delicate form, on the general surface. Fat begins to be deposited in the subcutaneous tissue. The muscular movements are brisk, although they may not yet have been recognized by the mother; and in abortions which take place at this epoch, the movements are not only vigorous at the moment of birth, but may continue for several hours afterwards.

With the completion of the fifth month, the length of the body will usually be found to have increased to from 8 to 10 inches, and its weight to from 10 to 12 ounces, or even more.

At six months, it is from 11 to $12\frac{1}{2}$ inches, and weighs something more than a pound avoirdupois. The growth of the hair has considerably advanced, and, in addition to that on the scalp, the eyebrows and eyelashes are also beginning to form. On the surface of the body, the cutaneous structure now becomes more distinct, and the cutis vera and epidermis may usually, on careful dissection, be separated. The invariable wrinkling of the surface is the result of the minute quantity of subcutaneous cellular tissue which is developed up to this time, in proportion to the other structures. In the male, the scrotum is very small and empty. The nails are already solid.

In the course of the seventh month the fœtus becomes from $12\frac{1}{2}$ to 14 inches in length. The bulk becomes, from this period, steadily increased, by the deposition of subcutaneous cellular tissue, and the development of various organs; but as the extent of this varies very greatly in different cases, it is difficult to say what should be stated as the average weight of this period. The bones of the cranium—in which the process of ossification has already considerably advanced—become more prominent, and the intervals between them less. It is usually said, that about this time the pupillary membrane disappears; but this is a question in regard to which very considerable discrepancy of opinion has arisen. Velpeau denied the existence of the membrane in the human species at any period, but the opinion usually entertained in regard to this point, is that which we have mentioned,—that it exists during pregnancy, up to the termination of the seventh month, and then disappears. More modern observations have, however, shown that it is incorrect to suppose that this membrane is lost at the time mentioned, but that it loses its vascularity in a great measure, and is

¹ The expression, "at the ——— month," is very loosely employed by many writers. When weeks are not mentioned, it is used in this work as meaning the completion of the ——— calendar month of the pregnancy.

so transparent that great difficulty is experienced in its demonstration. "In every instance," says Mr. Jacob,¹ "where I have made the examination, I have found the *membrana pupillaris* existing, in a greater or less degree of perfection, in the new-born infant,—frequently perfect, without the smallest breach, sometimes presenting ragged apertures in several places, and, in other instances, nothing existing but a remnant hanging across the pupil like a cobweb. I have even succeeded in injecting a single vessel in the *membrana pupillaris* of the ninth month." The eyelids now commence to open, and the testicles to descend in the scrotum.

By the end of the eighth month, the increase in the bulk of the child and its general plumpness become very obvious, and this is shown still more clearly by taking its weight and measurement as before, when it will be found that whereas the longitudinal measurement has not increased beyond 17 inches, and is probably less, its weight will have reached 4 to 5½ pounds. The skin is now red in color, is no longer wrinkled, and is covered with down. Upon its surface is observed, in greater or less quantity, little masses of curdy or sebaceous matter—a substance which is not of new formation, although it has become much more abundant. It may be noticed as early as the fifth month. The scrotum now contains one testicle, usually that of the left side.

On the birth of the child at the termination of pregnancy, it will be found to measure from 19 to 24 inches, and to weigh about 100 to 120 ounces (say, on an average, about 7½ pounds avoirdupois). The umbilicus was at one time believed to mark, at the full term, the middle point of the body, but the careful observations of Moreau and Ollivier d'Angers show that this is not the case, but that the middle point is generally about three-fourths of an inch above the umbilicus. With the complete development of the child, there is, of course, increased thickness of the nails, and a considerable addition to the adipose tissue, which sometimes, indeed, is so considerable in quantity, as to raise the weight of the infant considerably above what has been set down as the average, and that without any corresponding increase in its length.

Many fables have been narrated as to children which have been born weighing 20 to 30 pounds, and being 3½ to 4 feet long. Twelve pounds is looked upon as a very great and unusual weight for a child at birth, but there are in this country few practitioners of experience who have not seen one or more such cases. In 4000 cases in the Maternité, Madame Lachapelle only found one child which weighed 13½ pounds. Dr. Rigby says that Sir Richard Croft delivered a living child 15 pounds in weight. Mr. Owens delivered a woman of a still-born child² which weighed 17 pounds 12 ounces. Another case of a stillborn child which was said to weigh 19½ pounds is given by Cazeaux, but the weight was not taken by himself, and he seems to admit a doubt of it. Putting aside increased dimensions from disease, the above may be received as the extremes of authentic cases. It must

¹ Cyclopædia of Anatomy and Physiology. Art. "Eye."

² Lancet, 1835.

and ingenious as are many of the theories which have been advanced, it must be confessed that the problem has not yet been clearly solved. Few have prominently noticed the fact above mentioned, that the ovoid form of the fœtus is assumed while it is yet the embryo, and before it has been subjected to any influence arising from contact with the uterine walls. Manifestly, however, there is a cause—subsidiary it may be—which acts thus early on the embryo, to insure its safety at a later stage. But the point which, to the exclusion of others, has attracted, in this matter, the greatest amount of attention, is the *position* of the child, and the causes which lead to the inferior position of the head in such an enormous preponderance of cases.

The earlier theories which were propounded are more curious than instructive. It was very commonly assumed by the older writers that, in the early months, the head was normally uppermost, and that the sickness of early pregnancy was caused by an irritation produced by the hair on the scalp. It was further believed that about the seventh month the position became inverted, and that now, for the first time, the head was normally beneath.

Of all the theories which have been advanced to account for the presentation of the head, none attracted so much attention, or gained so much credence, as that which led to the opinion that it was due simply to physical gravitation. The fœtus, it was said, being suspended, by its centre, in the liquor amnii, by means of the umbilical cord, its heavier or cephalic extremity must, of necessity, gravitate downwards; and this view was strengthened by the fact, that the point of suspension was not the centre, but actually nearer the caudal extremity. It was obvious to those who refused to accept of this theory, that however it might be held as applicable to the first weeks of pregnancy, such a mechanism could have no share in producing or maintaining the position, after the cord had attained a length equal to the diameter of the ovum; and, further, if the theory were correct, that gravitation would be more likely to induce cephalic presentation in the early weeks of labor than at any other time. Every one knows, they argued, that, on the contrary, it is not at the beginning, but at the end of pregnancy, that this is most constantly observed, and, therefore, the idea in question is wrong. Dubois, who took a prominent position in opposing the gravitation theory, further disproved it by some interesting experiments, which he made by plunging fœtuses in water, and suspending them by the umbilical cord, when he found that it was not the head, but the scapula, or back, which hung downwards, and first touched the bottom. And to these arguments it might be added, that the placenta is not always attached to the fundus—which situation could alone admit of such gravitation; and again, that in the lower animals, the theory of gravitation would place the head at the fundus, whereas, here also, we find the head turned to the os. In women, moreover, who maintain the horizontal position during the whole course of pregnancy, the cranial position is as constant as in other cases.

An ingenious plea in favor of gravitation, as a cause of the ordinary position, has more recently been advanced by Dr. Matthews Duncan, who energetically controverts the opinions of Dubois, Simpson, and

Scanzoni, and who insists, with much propriety, that, in deciding this point, we should always remember that, while the mother is in the erect posture, or when she is lying on her back, the uterus is far from vertical; that, on the contrary, it is only when the trunk is inclined to the horizon, at an angle of 30° , that the uterus can be said to be vertical; and that the mature foetus is only horizontal when the woman lies upon her side. Dr. Duncan's arguments are of too controversial a character to be usefully epitomized; but they must be referred to with the respect which they merit, and which they will always command.

The name of Dubois is, in this particular matter, associated with a theory, the evidence in favor of which is, we must admit, singularly inconclusive. M. Dubois supposed that, in obedience to some instinctive impulse, or act of volition, certain movements were, towards the end of pregnancy, executed by the foetus, with the object of bringing the head into the lower segment of the uterus. This renowned obstetrician derives his chief argument from the harmony which he believed to exist between the object which nature had in view, and the means which she adopts, with a view to secure it. It is more than likely that Dr. Tyler Smith is correct when he surmises that, "had he (Dubois) written after the reception of Dr. Marshall Hall's great discovery of the spinal or physical movements, as distinct from the cerebral or psychical motor actions of the animal economy, he would probably have referred the motor powers of the foetus to reflex action, instead of to instinct or volition."

The late Sir James Y. Simpson, in a series of admirable papers on this subject, has attempted to prove that the position of the foetus is due, in the first instance, to a succession of reflex or "adaptive" movements, and that, when it has once assumed the usual position, it is maintained in it, when displacement is threatened, by a repetition of similar reflex acts, which rarely fail to insure its reposition. It is in this way, and on this principle, that violent foetal movements succeed such changes in the maternal position, as may lead to the displacement of the foetus; and he adds, further, that in cases of long cord, and in those in which the quantity of liquor amnii is much above the average, such movements on the part of the foetus are more frequent, and are of greater violence than usual. These last statements are certainly open to doubt. Cazeaux attaches great weight to the form of the uterus, as *mechanically* inducing the position of the foetus in the last months of pregnancy, the broader or breech end of the foetal ovoid being necessarily turned towards the fundus, and the smaller, or cephalic end consequently directed to the os. Some consider the child as composed of two ovals, one formed by the head, and the other by the trunk and limbs, and that corresponding to these, the outline of the uterus is observed to consist of a portion of two ovals, as may be seen by looking again at Fig. 72.

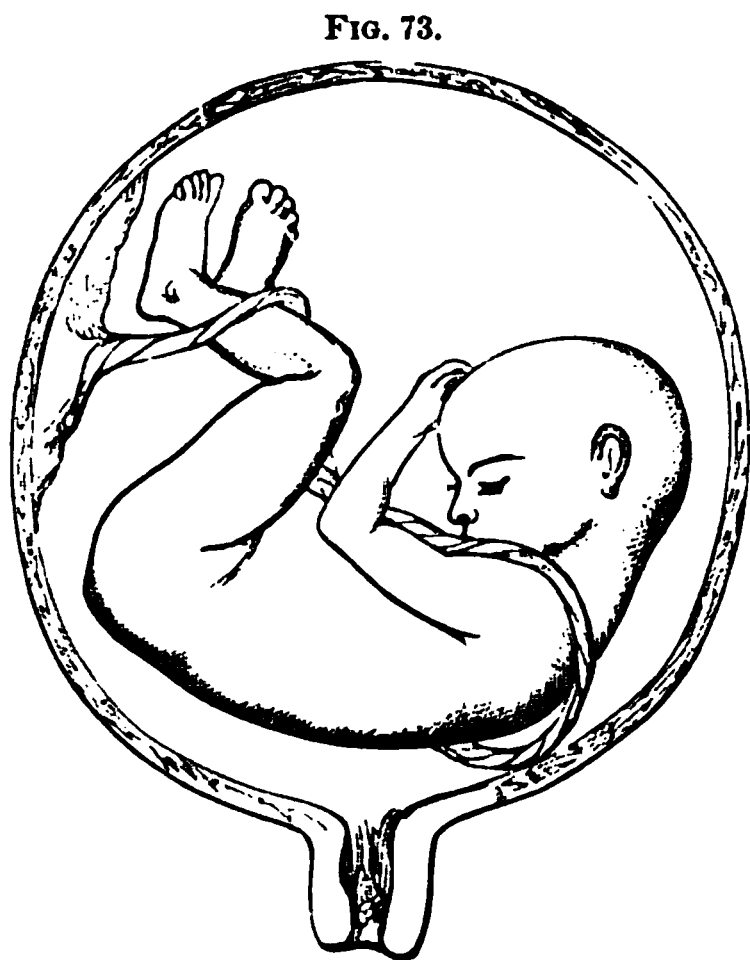
It must be remembered, however, with reference to these various theories, that it is only of cases at the full term that the head presents in 96 per cent.; and, with regard to most of the observations which have been made, that they have reference mainly to cases occurring at this period. It is universally admitted, that the earlier the period of

the pregnancy, the less constant is the position of the child. The following table, founded upon the observations collected by Professor Dubois, at the Maternity Hospital of Paris, has been constructed by

Period of Pregnancy.	Total Cases.	Presentations of			Percentage of Head Presentations.
		Shoulder.	Breech.	Head.	
Before end of sixth month,	121	5	52	65	52 in 100
During seventh month,	119	6	81	82	68 in 100
During eighth and ninth month, . .	96	2	22	72	76 in 100
At full term of gestation,	100	1	3	96	96 in 100

Simpson, and is, as he says, sufficient to prove "that the position of the foetus, with the head lowest, and over the os uteri, does not begin to be assumed till about the end of the sixth month, and that it is taken up with increasing frequency and certainty from that period onwards, to the full term of pregnancy." It must be noticed, however, with reference to this table, that, whereas the returns for the first, second, and fourth lines, have reference to children born during the specified period, whether alive or dead, the figures in the third line, of children born during the eighth and ninth month, refer only to children born dead.

The reason of the greater variety in position in the early months is sufficiently obvious. Not only is the child at this period smaller relatively to the cavity which is prepared for it, but the form of the cavity itself is such, as comparatively to encourage changes of position. Until the sixth month, the cavity of the cervix not having been as yet encroached upon, in the process of development, the child is contained in the cavity proper of the uterus, or rather of the body of the uterus. All anatomists agree that, up to this period, the cavity is round and not oval, so that, as in the annexed diagram (Fig. 73), a foetus of five months may move much more freely in any direction than is possible at the full time, when it is closely embraced by the pyriform or ovoid womb.



Uterine cavity at the fifth month.

It must be confessed, however, that the causes which lead to the presentation of the head, constitute a subject still shrouded in no little obscurity. The fact being clearly established, we see no need to pin our faith exclusively upon a single theory, particularly as it is more than probable that most, if not all of them, point to individual causes which, acting successively, or in concert, produce the effect which we have been considering. No theory

special means which are adopted for the protection of the important nervous centre, upon the integrity of which the life of the infant depends. When the head has passed in safety, it is rarely, indeed, that there is any difficulty in the birth of the other parts. To the obstetrician, therefore, one of the most important practical points in the study of his art is the thorough comprehension of the foetal cranium, and more especially of its relation to the pelvis, and to the other maternal structures which we have already fully described.

The Foetal Cranium.—The bones which compose the cranium and face are found, at the period of delivery, to have reached different stages of development. With a view, no doubt, to the perfect protection of the important organs at the base of the brain, the bones which form the base of the cranium, and the greater part of the face, are already so fused together as to admit of little or no movement. It is different, however, with the flat bones of the vault. The subjacent parts of the great nervous centre, being less essential to life, admit, with perfect impunity, of a certain amount of compression; and, in order that full mechanical advantage may be taken of this circumstance, the ossification of the flat bones is comparatively imperfect. The various parts of which the cranium is composed are, of course, familiar to every student of anatomy. It will suffice, therefore, to notice those points only which are of special obstetrical interest.

The Sutures are, first, the *sagittal*, which runs along the vertex, from the anterior to the posterior fontanelle. In continuation of this, there runs forwards a suture, which is peculiar to early life, and which is described by some writers as a part of the sagittal suture. This, which divides the frontal bone into two equal parts, is usually named the *frontal* suture. The *coronal* suture marks the line of demarcation between the frontal and parietal bones; while the *lambdoidal* suture runs outwards and downwards, from the posterior fontanelle, separating the posterior margin of the parietal from the occipital bone, and having thus the appearance of a bifurcation of the sagittal suture posteriorly, it presents some resemblance to the Greek letter from which it takes its name. At the base of each parietal is the suture which unites it to the corresponding temporal bone.

The ossification of the bones, at all these points of contact, is so incomplete as to admit of very considerable motion; and in some situations,—as at the sagittal suture,—the bones overlap each other to such an extent that, by reducing certain diameters, a great mechanical advantage accrues in the act of parturition. The angles of the bones are the points at which the development is least advanced, and it is here that certain gaps are left, where membrane only intervenes between the scalp and the brain, and through which the pulsations of the latter may be observed. These gaps are called the Fontanelles. The largest, the *great* or *anterior* fontanelle, or *bregma* (Fig. 74, *a*), is irregularly lozenge-shaped, of considerable size, and easily recognized by the finger during labor. The larger portion of it is in front of the coronal suture, whence it is sometimes continued forwards, almost to the root of the nose. The *posterior* fontanelle (*p*) is very much smaller, and is triangular in shape. As the occiput is almost always turned forwards,

it is this fontanelle which the finger usually touches in an examination during labor; but in well-developed crania, and more especially where overlapping of the sutures has taken place, it scarcely merits the name of a fontanelle, but is rather a point at which the lambdoidal and sagittal sutures meet. In a digital examination, it is of importance that the accoucheur should be able at once to distinguish between these fontanelles, for it is mainly by marking their situation that he is enabled to recognize the exact position of the head. At first, the student will find some difficulty in ascertaining this, but a little care and attention will soon enable him to overcome the trifling difficulty; and he will

FIG. 74.



Upper surface of fetal cranium.

FIG. 75.

Diameters of the fetal cranium.

find it useful, when in doubt, to run his finger round the gap, and count the sutures which run into it:—in the case of the anterior fontanelle, these are *four* in number, and, in that of the posterior, *three* only. The tumefaction of the scalp, which is so common an occurrence in difficult labor, may render such an examination difficult; but in the absence of this, the only circumstance which might mislead him, on a hurried examination, would be the presence of the irregular bones, called *ossea triquetra*. Some writers describe lateral fontanelles at the inferior angles of the parietal bones, anteriorly and posteriorly, but these are so covered in by the temporal muscles, that it is only under very exceptional circumstances that their observation can be of any practical moment.

It must now be obvious that a correct knowledge of the size of the cranium, and the relation which it bears to the pelvis in its various diameters, must in no small measure be our guide to intelligent and skilful practice. Numerous measurements have been taken of the fetal cranium, for the most part between points arbitrarily selected. It is, however, only the most important of these diameters with which the memory need be charged, viz., the *occipito-frontal*, the *occipito-mental*, and the *biparietal*; and, in addition to these, we shall mention only the *trachelo-bregmatic* and the *fronto-mental*.

The Occipito-frontal, or long diameter of the oval cranium, is an imaginary line, extending from the frontal eminences anteriorly to the occiput posteriorly. It is somewhat doubtful what some authors mean in this case by "the occiput," but there is no doubt that most modern writers, who are exact in the matter, describe it as terminating at the

summit of the occiput, or, in other words, at the posterior fontanelle. If, during labor, the position of the head in relation to the trunk were the same as in an adult in the erect posture, this would doubtless be correct. But if we recall the fact that the chin of the child is applied to the sternum, and that the occiput passes into the pelvis considerably in advance of the forehead, it seems more correct to adopt the view of Cazeaux and some others, and draw our line (Fig. 75, *a b*) to the occipital protuberance. The actual measurement, it is true, is only fractionally greater, but the line indicated is certainly more nearly in coincidence with the plane of the pelvic brim and the upper part of the cavity than that which is usually described.

The occipito-mental is the largest of the cranial diameters, and exceeds that just described, if we make an allowance for an average amount of moulding, by about an inch. It is thus of great importance with reference to the mechanism of parturition, and is represented in the figure by the line *o m*, drawn from the point of the chin to the posterior fontanelle. The Biparietal diameter (*b b* Fig. 74), extends transversely from one parietal protuberance to the other. The Trachelo-bregmatic, *t t*, is from the posterior extremity of the anterior fontanelle to the anterior margin of the foramen magnum; and the Fronto-mental, *b m*, from the level of the frontal eminences to the point of the chin. Most of these diameters will be increased or diminished in direct proportion to the amount of pressure to which the head is subjected, and the consequent degree of moulding which it undergoes. It is, on that account, extremely difficult to state averages. But, besides, the recognized difference which subsists between male and female crania, not to speak of the varieties depending on race, still further increase the difficulty. Taking, however, the average of male and female crania in Europe, the following measurements probably come very near the truth—if, at the same time, we make due allowance for average moulding, which, if we are to estimate the size of crania at the moment of birth, must certainly be done.

Average measurement of male and female Fœtal Crania:

Occipito-frontal diameter,	.	.	.	.	.	.	4½ inches.
Occipito-mental “	.	.	.	.	.	.	5½ “
Biparietal “	.	.	.	.	.	.	3½ “
Trachelo-bregmatic “	.	.	.	.	.	.	3¾ “
Fronto-mental “	.	.	.	.	.	.	3½ “

It is scarcely necessary to add that these measurements refer to cases in which the head is born in the occipito-anterior position. In other cases of abnormal or unusual position, the moulding will be modified to suit the requirements of the case, and the diameters will thereby be relatively altered. The same remark applies to circumferential measurements, which are usually stated, as regards the occipito-frontal circumference, as about fourteen inches, and for the occipito-mental as sixteen inches. According to Dr. Tyler Smith, “the ordinary presenting circumference, which passes under the occiput, and round the parietal bones to a little behind the bregma, is about eleven and a half inches.”

In descriptions of fœtal crania, and of cranial positions, the term

“vertex” is constantly adopted by English and American writers. Unfortunately, however, this is one of several terms which are so loosely used that it is necessary to give a definition before venturing to employ them. It is described in Todd’s Cyclopædia as synonymous with the anterior fontanelle; by Dr. Ramsbotham as a point a little in front of the posterior fontanelle; by Smellie as the whole space between the two; and by Schmidt as a point midway between the anterior and posterior fontanelle. Of all these the most usual description is that which places the vertex in or close to the posterior fontanelle. The expression “crown” or “vertex” implies that portion of the head which is highest in the erect posture. If so, the vertex can neither be the anterior nor posterior fontanelle, but a point intermediate between the two, varying somewhat according to the peculiar formation of different crania, so that it is difficult to determine the exact *point*. If it were absolutely necessary to describe it as such, we should probably closely approach the truth by placing it with Schmidt at a point midway between the two fontanelles. But if we consider the infinite varieties which obtain in the comparative position of the two fontanelles, as regards the pelvic axes, so that any one point of the sagittal suture may in certain cases present, it then becomes obvious that to the term vertex we must attach a more extended signification, if we would avoid complicated systems of classification. On these grounds we prefer the definition of Smellie, and shall use the term vertex as including the sagittal suture in its whole length, and on either side that portion of the parietal bone (once called *os verticis*) which lies between the suture and the protuberance.

Functions of the Fœtus.—The Fœtus being, during the whole period of its intra-uterine life, separated from the outer world, and immersed in a liquid medium, those functions which, after birth, are discharged under the usual atmospheric condition, and in consonance with the ordinary laws of nutrition, fall to be performed after a fashion adapted to the peculiar circumstances of the case. We find, therefore, that, in the absence of aerial respiration, certain special modifications of the circulatory apparatus have been adopted, with the view of affording that gas to the blood, and that nutritive material to the frame, without which life within the womb would be a physical impossibility. A knowledge of this subject is essential both to the physiologist and to the accoucheur, and it is only in the light of such knowledge that certain morbid phenomena and faults of development can be understood, and possibly, in some instances, obviated.

The life of the fœtus is maintained by an intimate union between the maternal and foetal circulatory systems, a union in which, although there is no junction of the two currents, there is ample provision for the mutual interpenetration of gases and fluids, and also for the interchange of cell elements. We do not allude now to the laws which regulate the development of the early embryo, but to the union which subsists after the development of the organs of connection which have already been described, and which exist in almost all the Mammalia. The lungs of the fœtus are, up to the moment of birth, apparently rudimentary. We

say "apparently," because, although in point of size and texture they present little resemblance to the organs of respiration, when that function has once been established, they are in the mature fœtus already perfect in structure, and only await inflation to become the important organs, the function of which only ceases with life. In the adult, and dating from birth, the circulation is usually described as consisting of two tracts, mutually dependent upon, and yet in a sense distinct from, each other, the systemic and pulmonary channels, through which the whole column of blood continuously and successively flows. In the fœtus, however, the function of the lungs being impossible, that portion of the circulatory current which is associated with the function of aerial respiration, is diverted from its course by special conduits, which join the circuit at a more advanced point, the pulmonary system being thus practically *nil*, although its apparatus is fully prepared against the moment of birth. From the systemic vessels, again, blood passes to the placenta by the umbilical arteries, and returns by the umbilical vein to join the general venous system of the mother. As the other functions of the fœtus depend chiefly upon the modifications of what we know as the adult apparatus, we may here describe these shortly.

The Fœtal Circulation.—The blood which returns from the placenta by the umbilical vein (Fig. 76, *d*), is charged with oxygen derived from the mother, so that the term "venous blood" is here, in its ordinary sense, inapplicable. After passing through the umbilicus, the vessel divides. A portion of its contents enters the liver, along with the blood which is being returned from the intestines by the vena portæ (*g*), and, after circulating in that organ, enters the vena cava at *h*. The greater portion of it, however, passes direct to the vena cava, by the *ductus venosus* (*a*), which joins the main trunk at a point a little lower than the hepatic vein. The blood, being thus mixed with the systemic venous current, arrives at the heart much more feebly oxygenated than it was at the umbilicus, and, passing into the right auricle, is directed by the Eustachian valve towards the *foramen ovale*, a special aperture through which the blood from the inferior cava is transmitted to the left auricle. From this point the current passes to the left ventricle, and from thence, as in the adult, to the aorta, almost the whole of this supply proceeding to the head and superior extremities by the three great vessels of the aortic arch, to return again to the right auricle by the superior cava. Although a mixture of the two currents from the *venæ cavæ*,

FIG. 76.

Circulatory apparatus in the fœtus.

necessary to the life of the fœtus; and second, that that supply cannot be obtained directly from the air. Whence, then, is it derived?

The full description, which was given in a former chapter, of the structure of the placenta, may suffice for an answer to this question, in so far as regards that period of intra-uterine life during which the placenta exists. But, for the period of embryonic life, some further description is required; and, indeed, there is still, in regard to this point, some necessity for extended research. M. Serres has described two periods,—the first of these, which he terms the period of *branchial* respiration, exists down to the time when the placenta is formed. He assumes that, among the villi of the chorion, there are a certain number (*villosités branchiales*) which dip into the lacunæ of the decidua reflexa, and are there bathed in a special fluid, from which the supply of oxygen is derived until, in the course of development, the second, or placental period arrives. To what extent, if at all, this theory may be admitted as correct, it is at present impossible to determine; nor would it serve any good purpose to enter here upon the discussion of this, or any mere physiological speculation. We shall at once, therefore, assume, as facts hitherto observed entitle us, that from the earliest period at which the necessity of a respiratory function may arise, the essential supply of oxygen is derived from the mother, and passes through the external surface of the ovum, the villi of the chorion, or the villi of the placenta, according to the stage of actual development. The function of respiration involves the interchange of gases; but whether this interchange takes place in consonance with the laws which regulate interpenetration of fluids, or by passing through some intermediate vehicle, as is presumed by Serres, the source of the supply may, in all cases, be assumed to be the same. In point of fact, the respiration of the fœtus bears the strictest analogy to the branchial respiration of fishes, in which a membranous structure only is interposed between the blood and the liquid from which the oxygen is to be derived. In the placenta, as we have seen, the parts are so disposed as to bring as large a portion as possible of the two systems, maternal and foetal, into contact.

That, in consequence of this contact, the blood undergoes important and vital changes is proved by many facts, pathological and otherwise. To compress the cord, is to cause the certain death of the fœtus; but more significant even than this is the fact, that after death from this cause, the physiological phenomena of apnœa are invariably developed. There exists, also, a marked respiratory antagonism between the placenta and the lungs. So long as the placental circulation is still uninterrupted, the new-born infant may live without pulmonary respiration, but, so soon as it breathes strongly, the blood no longer passes by the cord, or if it persists to a certain extent, it may at once be stopped by ligature. But if the child has not breathed, it is always wrong to tie a pulsating cord until aerial respiration has been set up. Finally, the respiratory function of the placenta has been proved by analysis of the blood from the umbilical arteries and veins, that in the vein always showing a comparative abundance of oxygen, although, as

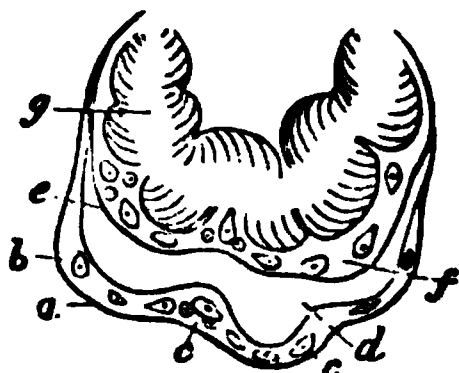
already mentioned, the quantity of the gas is not sufficient to establish that marked difference in color which enables us so readily to distinguish between ordinary arterial and venous blood.

Nutrition.—This function is intimately associated with that of respiration. All modern physiologists admit that the nutritive supply comes from the mother, but the exact manner in which it is absorbed, and the proportion in which it passes through various channels and media, are points which have given rise to endless disputes, and many hypotheses. It is certain that the nutritive material cannot, at all stages of embryonic and foetal development, pass through the same course in its way from mother to child; and, in truth, our knowledge of the history of development prepares us for the admission that the plan of nutrition must differ materially according to the stage at which the fertilized ovum has arrived. Even at the very earliest stage, while it still moves freely in the Fallopian tube, absorption from maternal sources may take place by endosmose through its external envelopes, which also admit of penetration by the fertilizing sperm of the male. But, in addition to this, there is a store of material, which we have reason to believe is in a great measure nutritive, contained in the umbilical vesicle. The quantity of this, and the proportion which it bears to the size of the embryo, is at first very great, but as changes succeed each other within the ovum, in the manner already described under the head of Development, the relative quantity dwindles, and the reservoir itself becomes ultimately absorbed, after being drained of its contents. The connection of the umbilical vesicle with the rudimentary intestine, the chemical composition of its contents, and, more significant still, the establishment in its walls of bloodvessels, proceeding from the foetus, suffice to prove this position. The only other possible channel through which material may, at this stage, reach the embryo, is through the vitriform fluid, which occupies the interval between the chorion and the amnion. After the development of the allantois, vessels are carried from the embryo to the chorion: the villi of the latter become enlarged and vascular, implant themselves in the decidua, and thus bring foetal vessels and foetal blood into the closest contact with the mother. Some have even believed that the villi plunge into the utricular follicles, and thence derive their pabulum.

With the formation of the placenta, this contact becomes localized, and at the same time, owing to the peculiar structure of that organ, is greatly increased in extent. Through the delicate membranes which separate the one system from the other, and in addition to the gaseous supply which constitutes the respiratory function of the placenta, there pass incessantly, in fluid form, materials which go to the building up of the foetal tissues. But it is not alone by a mere endosmose, or by mutual interpenetration, that this nutritive function is carried on, but by a process of intermediate cell-growth, in the course of which, materials are elaborated, with the express object of foetal nutrition. Good-sir's theory on this point is illustrated by the accompanying diagram (Fig. 77). His observations led him to the conclusion that the blood, in the vessels of the mother, is separated from that in the vessels of the

fœtus by the intervention of two distinct sets of nucleated cells. One

FIG. 77.



Diagram, illustrating Good-sir's theory of foetal nutrition.

of these, *c*, belongs to the maternal portion of the placenta, lies in contact with, and external to the ultimate maternal vessels, and is probably designed for the separation from the blood of the mother of the materials destined for the fœtus. The other layer, *f*, lies between the membrane of the foetal villus and the wall of the vascular loop which it contains, the object of these cells being to receive the material which has been elaborated on the other side. Between the two there is a space, *d*, into which the materials secreted by one set of cells is poured, in order

that it may be absorbed by the other. In this way, it is probable that not only are materials passed from the mother to the fœtus, but, that through the same agency, effete or excrementitious matters are transferred from the foetal to the maternal blood.

Another source from which nutriment may be drawn is the liquor amnii. Substances introduced into the stomach or blood of the female have been found in this medium, as well as in the fœtus and placenta, and its analysis has proved it to contain albumen, osmazome, and salts. Besides this, newly born calves have been kept alive by fresh amnionic fluid during a period of fifteen days. This being the case, many theories have been advanced, with the view of proving that nutritive material passed by this channel from the mother to the fœtus. The mammary glands, the genital organs, and the alimentary canal, have all been upheld as constituting the mediate channel of communication, but there can be little doubt that such communication, if it occur at all, is most likely to take place through the entire cutaneous surface. This idea is confirmed in an especial manner by the observations of Brugmans, who found, on removing the embryo from the amnionic pouch in living animals, that the lymphatic vessels of the skin were in an engorged condition, while those of the intestines, the functions of which had yet to be established, were found to be empty. If we admit that these facts establish the belief of nutrition through the liquor amnii, we see no reason to doubt what Scanzoni asserts, that a similar absorption may take place through the walls of the umbilical cord, and that this would be a more direct way than any to the main channel of the foetal circulation. Beyond all doubt, however, the main source of nutritive supply to the fœtus is the placenta, while the liquor amnii may be looked upon as an auxiliary medium, through which, possibly, certain special elements may be admitted.

Secretions.—The secretions of the fœtus are similar in their nature to those which are found after independent existence has been established, but are, according to the period of development, in a more or less rudimentary condition. It is necessary to mention here three only, the Bile, the Urine, and the Meconium.

The Liver is, in proportion to the size of the fœtus, and in comparison with the same organ in adult life, a viscus of great size. Prior to the fifth month, its structure is soft and pulpy, and the gall-bladder

has the appearance of a white cord ; but about this period the secretion of the bile commences, the characteristic structure of the liver becomes developed, and the gall-bladder commences to distend. Besides acting as an assimilating organ, by preparing materials for the blood and the tissues, its proper secerning function is to separate the hydrocarbonaceous portion of the protein compounds, and this function it discharges in the foetus, with special and increasing energy, after the placenta has been fully formed, most physiologists being of opinion that it is by this channel, and not through the placenta, that the carbon and other effete materials are chiefly removed. At the end of the seventh month, the gall-bladder will usually be found distended with bile, and a considerable quantity of its contents, charged with carbon, makes its way into the intestine.

The name *Meconium* is that which has been given to the excremental materials which are contained in the alimentary canal of the foetus. Up to the third month, the inner surface of the canal presents a slight moisture, but about this period the stomach and duodenum contain a small quantity of whitish albuminous fluid. At the beginning of the sixth month, the contents of the small intestine will be found to have assumed a deep yellow color, owing to the admixture of bile, which gradually becomes darker in hue as pregnancy advances. It now enters the great intestine, and ultimately, about the end of the term, occupies the rectum in considerable quantity, from whence it is ejected in presentations of the breech, and under various other circumstances which need not be here detailed. The meconium, then, is the result of a mixture of foetal bile with the material secreted by the mucous membrane of the digestive canal.

The Urine is secreted at an early period of intra-uterine life, when the structure of the kidneys is already very considerably advanced. It was at one time supposed that the bladder communicated directly, by the urachus, with a cavity in the allantois, which thus constituted a reservoir for the urine. The allantois, however, in man at least, no longer exists as a cavity at the period when the kidneys form and the secretion of urine begins, so that we are forced to believe that the urine must be evacuated into the amnionic cavity, a fact which seems to have been established by the discovery of urinary materials in the liquor amnii.

CHAPTER VIII.

PREGNANCY : SIGNS OF PREGNANCY.

PREGNANCY—THE GRAVID UTERUS: MUSCULAR FIBRES OF: MUSCULAR LAYERS—CHANGE IN FIBRES AFTER DELIVERY—DEVELOPMENT AND ANATOMICAL RELATIONS OF UTERUS AT VARIOUS STAGES OF PREGNANCY—SIGNS OF PREGNANCY—SUPPRESSION OF THE CATAMENIA—DIGESTIVE DISORDERS: MORNING SICKNESS: SALIVATION—KIESTEIN—CHANGES IN THE MAMMÆ: PAIN: ENLARGEMENT: SECRETION OF MILK: AREOLA: CHANGES IN NIPPLE, AND IN GLANDULAR FOLLICLES: SECONDARY AREOLA—ENLARGEMENT AND EXTERNAL APPEARANCE OF ABDOMEN: FLATTENING IN EARLY MONTHS: CHANGE IN THE APPEARANCE OF UMBILICUS: DIAGNOSIS OF OTHER ABDOMINAL TUMORS—VAGINAL EXAMINATION: COLOR: DIGITAL EXAMINATION: VAGINAL PULSE.

WHILE the ovum undergoes, in the progress of its development, the changes which have been detailed, the organism of the mother is also the seat of important anatomical changes and physiological phenomena. Among these, the changes which occur in the uterus naturally attract very considerable attention.

The Gravid Uterus, when we compare it with the unimpregnated organ, presents alterations, not only in magnitude, but in structure. Nothing could be more erroneous than the idea of the old physiologists that its development was a mere distension, similar to what takes place when we inflate an India-rubber bottle. There is, on the contrary, an increase in the quantity of its tissue, whereby its weight is progressively increased up to the end of pregnancy; and there is, moreover, an alteration in the tissues of which it is composed, raising its structure, so to speak, to a higher physiological level. The changes which the mucous membrane undergoes have already been incidentally referred to in connection with the formation of the decidua. In regard to the tissue proper of the uterus, we have found it, in the unimpregnated state, to be composed of interlacing fibres, which are somewhat irregularly disposed. Had no opportunity ever existed of examining these fibres in a gravid womb, it would perhaps have been held a bold speculation to maintain that these fibres are muscular elements of the non-striated variety. In the present state of histological science, nothing is more clearly demonstrated than that this is the case, even if the expulsive contractions of the uterus had not pointed to a similar conclusion. This is indicated with great distinctness in the accompanying illustration, where *a, a*, are nucleated fibre-cells from the unimpregnated uterus. Their embryonic or undeveloped condition shows in marked contrast with cells from the gravid uterus, which are shown in *bb, cc*, and *c*, at different stages of development.

fibres which is shown in the figure, and which is continuous with numerous powerful bundles passing over the fundus. A somewhat similar disposition of fibres is seen on the anterior surface.

The inner layer, as described by William Hunter, and before him, though much less accurately, by Ruysch, is that which corresponds to

FIG. 79.

FIG. 80.

External muscular layer of uterus.

Internal muscular layer of uterus.

the circular layer of the other viscera. It is thin, and composed of groups of fibres, the general direction of which is transverse, but arranged at either angle of the uterus, in a concentric manner, around the orifices of the Fallopian tubes, as shown in Fig. 80. Other groups encircle the middle of the body of the uterus, while others again are described as forming a sort of sphincter surrounding the os uteri. Between these two layers, a third or middle layer is generally described by modern anatomists, as being of considerable strength and thickness, with numerous bundles, flattened, and running in all directions in the substance of the organ. These interlace freely, and surround the vessels of the uterus, so that, when the organ is in a state of contraction, these vessels must be notably diminished in their calibre. Indeed, there is every reason to believe that it is mainly by their agency that hemorrhage is prevented after the separation of the placenta, the ruptured and gaping orifices of the utero-placental vessels being thereby closed.

Inseparably connected with the subject which we are now considering, is that of the *involution* of the uterus, or that process whereby the organ returns, after delivery, to a size and structure approaching that of the unimpregnated state. That the uterus, in a short time, is reduced in weight, from about twenty-four ounces to two, involves the certainty that rapid absorption takes place under very special conditions. How this takes place has been indicated by many physiologists, but by none has it been demonstrated so clearly as by Kölliker. The enormous fibre-cells which exist at the termination of pregnancy, are now huddled together in contraction, and, their function being over, absorption takes place, under favorable conditions, with great rapidity. They become the seat of rapid atrophy, and fatty degeneration, and the whole mass of the muscular tissue becomes soft and friable. The separation of in-

dividual fibres for microscopic examination is, on this account, not easy; but, if successfully removed, they will be found as represented in Fig. 81, where the appearance presented by them a fortnight after delivery is shown at *a*. About the fourth week, the development of new fibres in various stages, *b*, may also be observed. A large portion of the fatty and disintegrated matter is removed by the vagina in the lochial discharge; and a proportion still larger is probably absorbed into the circulation, and discharged ultimately from the system by the ordinary excretory channels. The latter has been supposed to contribute to the formation of the caseous matter in the milk first secreted.

That portion of the peritoneum which invests the uterus and neighboring parts, is evidently so disposed in the unimpregnated state, as to admit of free extension during pregnancy. It is in this way that the

FIG. 81.



Degeneration of fibre-cells after delivery.

FIG. 82.



Diagram, showing development of uterine cavity. (After Schultze.)

broad, as well as the anterior and posterior ligaments unfold themselves, as the uterus slowly develops, until, at last, they entirely disappear. But it is not by a mere mechanical process such as this, that the serous covering of the womb adapts itself to the exigencies of the pregnant state, but, in addition, by an actual hypertrophy of its tissue. Were the former alone the case, the extension thus furnished would not be possible without thinning of the membranes; but as we invariably find that, at the very end of pregnancy, the membrane in question is as thick as before, we infer, that in this case, as in large herniæ and certain other morbid conditions, the serous, as well as the muscular and mucous coats of the womb, undergo marked hypertrophy.

The development of the ovum within the womb, the various stages of which we have traced, is necessarily accompanied by a corresponding increase in the volume of the uterus, and by marked changes in its

of its development, it is easy to understand how the uterus, with a tendency towards the right side, will be still more encouraged in its movement in that direction, by the prominence of the vertebral column in the middle line. Or, if we reject the theory of the influence exercised by the rectum, we still see, in the relations which subsist between the expanding uterus and the vertebræ, a sufficient cause for deviation from the middle line. And it is certain that, in a large proportion of cases, this deviation is to the right side.¹ If we reflect that the line which represents the axis of the uterus is nearly coincident with the axis of the brim of the pelvis, and remember the marked projection of the lumbar vertebræ, we shall have no difficulty in appreciating the causes which lead to the uterus being in immediate contact with the anterior abdominal wall, so that it is a rare occurrence when we find any portion of the intestines intervening between the abdominal and uterine walls in this situation. At the termination of pregnancy, then, the uterus, with the ovaries, Fallopian tubes, and other structures closely applied to its sides, occupies a great part of the abdominal cavity. Its usual relations are as follows: In front with the vagina, the neck, and posterior wall of the bladder, and the anterior abdominal wall; behind, with the rectum and the promontory of the sacrum below, and the mesentery and the intestines above; on the right, by the cæcum and the right abdominal wall; and on the left by the sigmoid flexure of the colon, and usually the great bulk of the small intestines.

Signs of Pregnancy.—The development of the womb, and that, already described, of the germ which it contains, constitute the essential anatomical and physiological phenomena of the pregnant state. Associated with it, however, and dependent upon its continuance, are numerous other manifestations, which have their seat in organs so remote that it is difficult, in many cases, to trace the sympathy which exists between them and the special organs of generation. There is, in point of fact, no single function of the whole economy which may not be affected by the operation of a cause which has its centre in the generative organs, and which radiates thence throughout the entire system. Consequently, phenomena are frequently observed in distant organs, which are certainly not associated in function with the womb; but so constant is the occurrence of these phenomena, that they have come to be familiarly looked upon as among the early symptoms of pregnancy. More important are the symptoms which have their cause and seat in the generative organs; but in the observation even of these there are, as in the case of the others, so many sources of fallacy, so many pitfalls of error, that obstetrical writers have uniformly, and with obvious propriety, made a study of the Signs of Pregnancy—one of the most prominent objects to which it is desirable that the attention of the

¹ It has been held, among the causes which have been advanced to account for this displacement to the right, that the weight of the placenta gave rise to it, it being more frequently, according to Levret, on the right side. The presence of the descending colon on the left, the habitual use of the right hand in preference to the left, and the habit of lying on the right side during sleep, are a few among the many reasons which have been propounded to account for the phenomenon.

student in this department should be drawn. We can conceive no subject in regard to which a mistake might so utterly ruin a young man's hopes, than the determination, in delicate or doubtful cases, of this question of pregnancy. An obvious pregnancy overlooked, because the idea has never crossed the mind, is bad enough; and we have known a practitioner of thirty years' standing blister the abdomen in the ninth month, under the idea that he was treating a morbid growth. But what is far more inexcusable is the culpable rashness of those who, without irrefragable evidence of the existence of pregnancy, would venture—as has been done in high quarters—to brand a woman with the stigma of dishonor. To enable the practitioner to avoid these and similar errors, the symptoms which indicate pregnancy have been arranged, with a view, more especially, of assigning to each its actual diagnostic value, and determining the period at which, in the course of a pregnancy, it is available. We shall find that the number of symptoms, which are of themselves conclusive as evidence of pregnancy, is very limited; but the other, and more numerous group, constitute an important chain of circumstantial or corroborative links, which, under ordinary circumstances, enable us to admit the strongest probability of an event which may be either dreaded or longed for. The convictions of a woman whose most earnest desire is to be a mother, and the passionate asseverations of another whose chastity is called in question, are disturbing elements which tend to throw us out in our calculations, and must always be taken *cum grano*.

In classifying the Signs of Pregnancy, various plans have been adopted, but what seems more rational, and what certainly is much more satisfactory than any attempt at rigid classification, is to take up the symptoms, as nearly as may be, in the order in which they are manifested. The earliest of all the symptoms have their seat in the generative organs, but are of little value from a practical point of view, inasmuch as they consist in physiological and anatomical manifestations which are almost entirely beyond our ken. It is certain that the fertilized ovum, on its arrival within the cavity of the uterus, finds that organ in a condition suitable for its reception. Probably the conditions which we have seen to exist, in ordinary healthy menstruation, as regards the tissues of the womb, are, under the special circumstances of conception, prolonged, and ultimately pass, by a series of developmental changes, some of which have been described, into those which are characteristic of the more advanced stages of pregnancy. Or, supposing even the uterus to be quiescent, and not under the influence either of a past or of an impending menstrual molimen, we may assume that one of the earliest effects of impregnation is a marked congestion and hypertrophy of all the uterine structures; changes which, though easily enough demonstrated after death, are not so easily appreciated during life, and are in reality of little actual diagnostic value. Still, the increased weight and heat of the uterus, the increased resistance in the upper and anterior wall of the vagina,—due, it has been said, to a slight anteversion of the womb usual at this period,—may, along with other symptoms, excite in the mind of the experienced practitioner suspicious which, under other circumstances, might not have arisen.

subsists between these upon the one hand, and the womb on the other. Although the exact period at which such symptoms develop themselves varies greatly, there is scarcely a single case in which, at some time or other, symptomatic digestive disorders do not manifest themselves. The most frequent of all is nausea, generally accompanied with vomiting, and this symptom being of much more frequent occurrence in the morning than at any other time of the day, has given rise to the name *morning sickness*.

In the absence of any special cause which might give rise to nausea or vomiting, and if the general health apparently remains good, this sign is sometimes of considerable value. It is generally, however, to the early months that this nausea is limited, and it usually terminates or is mitigated about the time that the fundus may be observed above the pubes, having commenced probably about the fourth or fifth week. The period of development, and the duration of this symptom, are subject to great irregularities; in one case, it may be, beginning with the first days of pregnancy, and continuing to the last, while in others it does not commence until an advanced period, when local irritation of the stomach is more likely to be the cause. We have seen cases in which, at first, morning sickness was as marked as usual, to this succeeded a period of immunity, extending over several months, the nausea returning with great discomfort to the patient during the last weeks, being probably due in the first instance to sympathy, and in the latter to the effect of proximity of the organs. Associated with the more familiar symptoms of morning sickness, are others which also have their origin in the digestive system, such as heartburn, pyrosis, epigastric pain, and troublesome eructations. Repugnance to various articles of diet, which possibly were relished before pregnancy, or a longing for unusual, and even deleterious or disgusting substances, such as occurs in chlorosis, are by no means unusual symptoms. Very rarely, indeed, do we meet in practice with cases in which some one or other of the above symptoms is not present, but there are cases in which, from first to last, no such symptom develops itself. Nor are the symptoms manifested during one pregnancy any sure criterion of their probable form in another, for we often find that a woman, who has suffered intensely in her first pregnancy from these digestive disorders, is on subsequent occasions remarkably free from them; nay, it may happen that women, who have never had morning sickness, complain of it for the first time on the occasion of a fifth or sixth pregnancy. All the affections alluded to constitute, when excessive, morbid conditions, and as such fall to be considered as disorders of pregnancy.

Salivation, although not a symptom of any practical importance, is occasionally so marked in degree as to constitute a prominent feature in the case. In this, there seems to be a special glandular sympathy, manifesting itself in a hypersecretion, which may last during the whole term of pregnancy. Under the same category of phenomena which have their origin in the glandular system, we may here notice certain changes in the urine which, since the time of the ancients, have attracted attention as symptomatic of the pregnant state. About thirty years ago, a number of observers directed their attention to the

investigation of this subject, but the person whose name is most intimately associated with it is M. Nauche, by whom the name *Kiestein* was given to the substance referred to. From the numerous observations which have been made, by him and others, it would appear that the period of pregnancy at which this has been discovered varies considerably; that it is certainly not present in all cases of pregnancy; and that it has been discovered in certain morbid conditions which have no relation to the pregnant state. This, of course, reduces the value of *Kiestein* as a sign of pregnancy to a low level, but there can at the same time be no doubt whatever, that in a very large proportion of cases the substance may be discovered. When the urine is fresh from the bladder, there is no appearance whatever which would enable us to distinguish it from the ordinary excretion. About the third day, or sooner, it commences to lose its transparency, and becomes hazy as if mucus were suspended in it, and, shortly afterwards distinct traces may be seen, on the surface, of the formation of a pellicle, which is at first thin and transparent, but subsequently becomes much thicker and more opaque. About the third or fourth day, the distinctive characters of this pellicle usually reach their greatest intensity, and little flocculent portions then commence to detach themselves from its under surface, and sink through the liquid to the bottom of the vessel. The whole pellicle ultimately goes through this process, and becomes thus transformed into a whitish deposit which gravitates to the bottom, as did the flocculi first detached. The original pellicle is then replaced by another, which contains, as indeed may the first one, crystals of triple phosphate: the liquid becomes more turbid, until, finally, the appearances characteristic of pregnancy become lost in the process of putrefaction. *Kiestein*, then, first makes its appearance in the urine, under the form of a cloud, like cotton in suspension, which is due to the aggregation of little globules which exist in the urine when passed. These subsequently unite, rise to the surface, and constitute the pellicle which we have described. It is said that, when *Kiestein* is present in the urine, it persists from the end of the first month until delivery; but the observations of Cazeaux throw much doubt on this assertion, as regards the last six weeks, for he tells us that he examined in 1849 the urine of fifteen women at this stage of pregnancy, without discovering any trace of it. Chemical and microscopical researches seem to show that *Kiestein* is a new formation, and is an azotized substance, and that it presents itself under the form of minute globules. Whether the theory usually entertained in regard to it, that it is the result of an excretory function of the kidneys, peculiar to the circumstances of the case, is a question which we must in the meantime leave in doubt, but it must be admitted that there are several facts firmly established in physiology, which, from an analogical point of view, give some confirmation to the hypothesis.

Changes in the Mammæ.—The Mammæ are, from an early period, the seat of certain symptoms and changes, which are justly looked upon as of great importance. When we reflect on what their proposed function is, we cannot marvel that, even thus early, they become the seat of changes, which are evidently designed with the view of elaborating,

and otherwise preparing, these important structures against the time when they will be called upon to discharge the function in question. The earliest indications which are given by the mammæ of the existence of pregnancy, are certain vague sensations, which are described by the woman as of fulness and weight, but which not unfrequently amount to considerable uneasiness, and even acute pain. This points to the awakened activity of the organs, further evidence of which is soon shown in a considerable increase of volume, due obviously to the greater afflux of blood, which dates from the earliest weeks, and which manifests itself at a more advanced period, by the presence of large blue veins, which may be seen coursing under the skin, more conspicuously in women of a blonde complexion. To the touch, the gland seems harder than usual, and here and there may often be felt clusters of enlarged milk vessels, which give the impression of knotting. Towards the end of pregnancy, or, if the distension is extreme, at a much earlier period, silvery white lines are seen upon the surface of the breast, radiating from the nipple as from a centre. These are due to the distension of the cutaneous structures, and the yielding of the subcutaneous cellular tissue at some points, so as to give facility to the expansion due to growth of the gland.

The secretion of milk in the breasts has very generally been supposed by the vulgar to be an infallible sign of pregnancy, either past or existing. Nothing can be more erroneous than such a conclusion: but, at the same time, the presence of milk in the ducts is, when taken along with other signs, often of very considerable importance. It is proper to mention, however, that not only is milk in the breasts no certain sign of pregnancy, but numerous cases are recorded by Montgomery and others, where the breasts of young women who had never been pregnant, and of old women past childbearing, have yielded milk in sufficient abundance to suckle a child. A striking case of this nature was narrated to the writer by Dr. Livingstone, the renowned African traveller, who had so investigated the circumstances as to eliminate even the possibility of doubt. A native woman was delivered of twins, and not being constitutionally very robust, was unable to nurse both, whereupon the grandmother, a woman of sixty, took one infant, when, after repeatedly placing it to the breast, the secretion was so abundantly established, that she proved an excellent nurse. Nay, more than this, there have been cases in which the gland in the male has secreted milk in considerable abundance.

Surrounding the nipple, and circumscribed by a circle of about three-fourths of an inch radius from its centre, the skin presents, in the adult and unimpregnated condition, a peculiar appearance, which consists chiefly in an increased depth of color. It is thin and delicate, and presents to the eye the semblance of a structure intermediate between skin and mucous membrane. From its surface, small glandular projections, varying in number from twelve to twenty, or more, may be seen to project slightly. This area, which is called the *Areola*, is the seat during pregnancy of changes which are frequently of the greatest importance in strengthening the presumptive proof which may already exist; but it must always be remembered that changes, closely resem-

bling those which we are about to describe, may be produced by causes which have their seat in the generative system, but which are independent of pregnancy; and, moreover, that as the changes are to a considerable extent permanent, it is in first pregnancies that they have the greatest diagnostic value. The following are the appearances referred to: If the breast be carefully examined about the ninth week, a considerable increase in the size of the nipple will almost always be observed, this structure having become turgid, and, as it were, erect. Simultaneously with this, or closely succeeding it, there is a deepening in the color of the areola, an increase in its diameter, and a greater prominence and development of the follicles which stud its surface. It participates, obviously, in the increased vascularity of the nipple, and becomes, like it, moist and turgid. The alteration in color, which is due to this turgescence, takes place in all cases, but it is only in women of dark complexion that the characteristic changes of the areola are to their fullest extent manifested. In these, there is an actual deposit of pigment, and the depth of the color is, towards the termination of the pregnancy, not unfrequently such as to present a most striking and peculiar appearance. Examination of the follicles has shown that they are possessed of excretory ducts, through which their secretion may, under certain circumstances, be expressed.

At a period not earlier than the fifth month, there may generally be observed, in women in whom the areola is deep in color, some trace of what Montgomery has described under the name of *secondary areola*, and to which he attaches great diagnostic significance, amounting indeed, in his opinion, to a certainty of pregnancy independent of other signs. This secondary areola, which immediately surrounds the other, is, even when most distinct, very faint in color, and has been well compared to the effect produced by drops of water falling upon a tinted surface, and discharging the color. An attempt has been made in the accompanying cut (Fig. 83), to indicate the various appearances referred to.

The pigmentary deposit, on which the appearance of the areola of pregnancy in a great measure depends, is not in every case limited to the situation in question. In a large proportion of cases, a dark line, about a quarter of an inch in width, may be observed running along the middle line of the abdomen, from the symphysis to the umbilicus, and occasionally extending from thence as far as the ensiform cartilage. A dark-colored disk, occupying and surrounding the umbilicus, was occasionally observed by Montgomery, and is described by him under the name of the "umbilical areola;" and brownish streaks, analogous to the silvery lines in the breasts, are not uncommonly to be seen in the abdominal walls, running parallel to each other, and generally curved, with the convexity towards the groins. These streaks lose their color, but do not disappear after delivery, and are therefore of some importance in determining the question of previous pregnancy. As an occasional concomitant of pregnancy, there has also been observed a more general discoloration of the skin, so much so, indeed, as to give rise, in one case at least, to the suspicion of existing disease of the suprarenal capsules. In the case in question, the whole forehead,

and part of the cheeks, neck, and breast, was deeply tinged of a yellowish-brown color, but within a few weeks after the birth of the child this had completely disappeared, nor was there at any time the slight-

FIG. 83.

Areola, and secondary areola of pregnancy (seventh month).

est symptom, in addition to the discoloration, to encourage the belief in the existence of the disease of Addison.

The appearance of the abdomen, although a very conspicuous sign of pregnancy, can only be admitted as such on the careful exclusion of certain sources of fallacy. For not only may solid tumors of various kinds give rise to appearances very similar, but fluid accumulations, such as ovarian cysts or dropsical effusions, or even distension of the bladder, may delude the unwary into a hurried and erroneous diagnosis. It behooves the observer, therefore, to be careful how he admits this point in evidence. Cessation of the menses, with abdominal enlargement, would almost certainly be admitted by an expectant mother and her friends as proof sufficient, but it sometimes falls to the duty of the medical attendant to dispel such illusions. Passing over, for the moment, the evidence to be derived in such cases by the practice of palpation, a certain amount of information may be obtained by the eye alone, in examining the abdomen in the various stages of pregnancy.

As we have already seen, the uterus, during the early weeks of pregnancy, instead of rising upwards into the abdominal cavity, actually falls downwards towards the floor of the true pelvis. This fact gives rise to the earliest modification in the outline of the abdomen, which consists, not in an enlargement as might have been expected, but in a dragging downwards of the umbilicus, and a flattening of the hypo-

gastric region. This fact has been long recognized, and its expression is embodied in the old French proverb, quoted by all writers, "Ventre plat, enfant il y a." Actual abdominal enlargement dates from about the thirteenth or fourteenth week, but so much depends upon the figure of the woman, the number of children she has borne, the position of the child, and the quantity of liquor amnii, that the mere study of the abdominal outline would, in so far as uterine development is concerned, rarely afford us reliable information. The most important observation to be made consists in a careful examination of the umbilicus. During the first three months, the depression of the navel is somewhat deeper than usual. On the expiry of this period, it regains its original appearance. In the course of the fourth month, it becomes less hollow than before conception, and from this time the depth of the cavity becomes gradually diminished, until, about the seventh month, it becomes completely effaced, and is on a level with the surrounding skin. Nor do the changes of the umbilicus cease here, for during the two last months the umbilicus protrudes beyond the surface, being, as it were, inverted by the pressure which is brought to bear on the inner surface of the abdominal wall by the distending womb. This is a pretty constant sign, and is certainly the most important to be derived by an ocular observation of the abdominal wall; but similar phenomena may be caused by ascites and tumors.

In so far as external appearance is concerned, there is scarcely any variety of solid tumor connected with subjacent organs, nor even any tumor, due to fluid or gaseous distension, which may not, under certain circumstances, give rise to the suspicion of pregnancy. It is rarely, in practice, that the differential diagnosis of such affections presents any great difficulty; but there are cases in which difficulties undoubtedly exist, when recourse must be had to percussion and palpation, to remove such doubts as may arise. Such an examination enables us to determine the shape and limits of the tumor, and the relation which it bears to the bowels and other surrounding parts. Nothing is here of such importance as the consistency of the tumor. The extreme hardness of uterine fibroids, on the one hand, and the yielding softness of gaseous or fluid distension on the other, represent the extremes; between which endless varieties exist. But the uterus, when distended, communicates to the hand a feeling so peculiarly its own, as to enable any one possessed of the requisite *tactus eruditus* to pronounce on the subject almost with certainty. This feeling consists in a certain elasticity which, although it may be simulated, is different from that which is communicated by any other form of abdominal tumor. Besides this, the practice of palpation seems, in some cases, actually to cause a certain amount of feeble, painless contraction in the womb, which, when distinctly felt, is of the highest diagnostic value; but it must be remembered that these symptoms prove only that it is the uterus which we are touching, and are no evidence of pregnancy. If, however, we are convinced that the elastic tumor contains a solid movable body, there is scarcely any room for doubt. In cases where, from unusual thickness of the abdominal walls, or from some other cause, palpation gives obscure results, the history of the tumor, and, especially, the

of the vaginal arteries. This, which is a sign of no great importance, has been described by Osiander under the name of *vaginal pulse*. During the later months, it is by no means unusual to find the mucous membrane hypertrophied and covered with small granulations or papillary projections, which are supposed to be the result of an abnormal development of the mucous follicles, and which are, certainly, often accompanied by an augmented mucous secretion. The chief, and in many cases the sole object of vaginal examination is to ascertain the condition and anatomical relations of the inferior segment of the uterus; and, more especially, the state of the os, and of that portion of the cervix which projects into the vagina. In those early weeks, during which the uterus descends within the cavity of the true pelvis, the descent is said to be accompanied by a certain amount of anteversion, which enables the experienced accoucheur, as early as the sixth week, to recognize in the anterior vaginal cul-de-sac a fulness or slight resistance, which is absent in the normal and unimpregnated condition of the parts. As pregnancy advances, this becomes more distinct, although higher, until the most depending part of the fœtus can be distinctly recognized through the anterior uterine wall.

CHAPTER IX.

SIGNS OF PREGNANCY (CONTINUED).

CHANGES IN THE OS AND CERVIX UTERI: PROGRESSIVE SOFTENING OF: CHARACTERS OF AT VARIOUS STAGES: (A) IN PRIMIPARÆ, (B) IN PLURIPARÆ—POSITION OF OS IN RELATION TO PELVIC WALLS—PRACTICE OF THE “TOUCHER”—EXAMINATION PER ANUM—QUICKENING: FŒTAL MOVEMENTS OBSERVED: (A) BY THE MOTHER, (B) BY THE ACCOUCHEUR—BALLOTTEMENT OR REPERCUSSION—FŒTAL PULSATION—FUNIC SOUFFLE—UTERINE SOUFFLE: THEORIES AS TO ITS PRODUCTION—STETHOSCOPIC EXAMINATION OF FŒTAL MOVEMENTS—SIGNS DIVIDED INTO CERTAIN AND PROBABLE—TABULAR RÉSUMÉ OF THE SIGNS OF PREGNANCY.

It is from the observation of the Os and Cervix Uteri that the most important information is derived in the course of a vaginal examination; for not only does this give us indications of pregnancy at a very early stage, but it enables us in many instances to judge, proximately at least, of the stage which the pregnancy has attained. From a very early period of gestation, a difference takes place in the firmness and resistance of the cervical tissue, which is due, in the first instance, to the congestion and hypertrophy of which this, as well as the other portions of the uterus, are, immediately after conception, the seat. But, in addition to this, there is a special change, which a few careful examinations by the finger will enable any one to recognize, and which is admirably described by Cazcaux. “Towards the end of the first month,” he says, “one may already discover that, in addition to the

first general modification, that portion of the lips of the os which is situated most inferiorly, or rather most superficially, begins to soften. This appears to be rather an œdematous condition of the mucous membrane, than an actual softening of the tissue proper of the lips, so that, in pressing slightly upon the thick and softened membrane, the finger at once perceives its fungous softness, but seems immediately afterwards to reach the tissue proper of the neck, which still retains its normal consistence. The sensation thus conveyed closely resembles that which we obtain if we press with the finger upon a table which is covered with a thick and soft cloth. It is not till towards the termination of the third month, or the beginning of the fourth, that the entire thickness of the lips of the os is softened, to the extent of two or three millimetres. From the fifth month, the softening extends from below upwards, and, at the sixth, reaches the centre of the vaginal portion of the cervix. During the three last months, it invades, step by step, the superior part, until it reaches the internal os, so that at the end of pregnancy, the neck is so soft, in the case of certain women, that I have often observed that students had great difficulty in distinguishing it from the walls of the vagina." This, according to the distinguished accoucheur, from whom we have quoted, should be looked upon as a very important sign of pregnancy, and is very constant in its occurrence, unless it be in cases where the tissue of the cervix is the seat of pathological alterations.

The shape of the os and cervix also undergoes, during the advance of pregnancy, some very remarkable changes. The os very early loses the form of a transverse slit, and becomes more circular in form, while the comparative softness of the tissue admits sometimes of the introduction of the point of the finger. This becomes much easier as pregnancy advances; and the softening process described by Cazeaux extends, so that, by the sixth month, it is occasionally possible, even in primiparæ, to introduce the point of the finger. A reference to the diagram already shown (page 145) indicates the manner in which, when the cavity proper has been distended up to a certain point, that of the cervix becomes invaded in the march of development. Although the stealthy invasion of the os by the softening process causes the cervix to seem shorter at a much earlier period, as, indeed, it is described by many writers, it is not till after the twenty-fourth week that the os internum yields; and the cavity of the cervix being then encroached upon, the shortening of the cervix, or rather its obliteration from above downwards, becomes more and more apparent, until, at the termination of pregnancy, no trace whatever of it can be discovered, and the finger, when introduced, comes into immediate contact with the membranes. In the following diagrams is indicated the condition of the os at various stages of pregnancy.

There is every likelihood that the description here given, which differs little from that of almost all English writers, is pretty nearly accurate as regard first pregnancies; and in the diagrams (Figs. 84, 85, 86), it may be observed that the general appearances are those which may be supposed to indicate the result of a first impregnation, as is shown, more especially, by the smoothness of the lips of the os.

tailed, and consist mainly of fissures and irregularities in the lips of the os, which deprive the orifice of its symmetry and smoothness. When, under these circumstances, the uterus develops in the course of pregnancy, the conditions vary, and necessarily vary very considerably. The softening process attacks the tissue of the cervix in a manner precisely similar to that which obtains in the case of primiparæ. There is in this case, however, a gaping external orifice, which admits easily, even earlier than the twenty-fourth week, the point of the finger. From this period onwards, till about the thirty-sixth week, the only change which takes place is, that the cavity of the cervix becomes more and more accessible to the finger. The mechanical effect of previous pregnancy seems to be that the cavity proper admits of a more ample distension, so that no call is made upon the cavity of the cervix until the termination of pregnancy approaches. Even in those instances in which the cavity of the cervix is most easily permeable by the examining finger, the os internum is, in pluriparæ, often found quite impassable at the thirty-sixth or thirty-seventh week. From this period, however, a very rapid shortening of the cervix takes place during the last few weeks, until, at the fortieth week, as in primiparæ, the cervix is in a manner effaced. But there remains to the last, instead of the thin, smooth, and almost membranous margin of the os in primiparæ, an irregular œdematous lip, which is in the highest degree characteristic, and which is not wholly lost even during the first stage of labor. There is represented in the diagrams on p. 159 (Figs. 87, 88, and 89),—which may be compared with the adjoining figures,—the distinguishing features of the pluriparous os, as observed from the vagina.

The description, then, which is usually given of the state of the os during the various stages of pregnancy is applicable only to the case of those within whom a foetus is, for the first time, being developed. Rapid as is the process by which the uterus is reduced in size after delivery, it never completely regains its virgin state. The os and cervix are the parts which show most distinctly the peculiarities which attach to those who have already borne children; and, in the course of a digital examination, this peculiar feature comes prominently under our notice. This method of examination, therefore, enables us not only to recognize the stage of the pregnancy, but also to distinguish between first and subsequent pregnancies, due regard being had to the manner in which the cervix is developed in the two classes of cases. Stoltz asserts that the description usually given is, in all respects, inaccurate; and that in primiparæ, as well as multiparæ, the cavity of the cervix is not encroached upon till within a fortnight of the time of delivery. The facts to which attention was originally directed by Désormeaux, and which have been abundantly confirmed by subsequent observations, are not admitted by Stoltz and Cazeaux as proof, even in first cases, of encroachment from above upon the cavity of the cervix; but are said to be due to an approximation of the os internum and os externum, and a fusiform expansion of the intervening cavity—due to the softening process already so often alluded to. We believe, however, that the original description is in the main correct as regards primiparæ, although

Désormeaux and his followers go too far when they assume that the shortening of the cervix commences so early as the fifth month.

The position of the os uteri, relatively to the walls of the pelvis, is another point which is disclosed in the course of a vaginal examination. This is, however, of more importance in conveying information as to the stage of pregnancy than in regard to the fact of its existence; but as it may, under certain circumstances, become an important point in evidence, its omission here would be improper. We have already seen that, in consequence of the growth downwards of the uterus, the os is, in the first instance, displaced in the same direction, and, as we believe, somewhat forwards. This is a point, however, in regard to which writers are not agreed, and a description, which is quite the opposite of this, is given by some of the most distinguished English writers, who maintain that the os, during the first weeks, is displaced downwards and backwards. The escape of the uterus from the true pelvis, and the subsequent and rapid upward development of its body, soon causes a corresponding movement upwards of the os, which thus seems to follow the fundus, in proportion to its development, steadily upwards in the pelvis from the tenth to the thirty-seventh week, when it attains the highest point, and is reached by the finger sometimes with a little difficulty. With the descent of the uterus in the last weeks, it again sinks downwards, and, at the same time, moves backwards; so that, though lower, it is not more within reach of the finger. This final movement corresponds to the falling downwards and forwards of the fundus, to which reference has already been made. Sometimes the head descends to an unusual degree in the pelvis, and, in such cases, may push before it the anterior segment of the uterus. From this cause a difficulty occasionally arises, which may even give rise to the suspicion of congenital absence of the os; but a careful examination by the finger, in the direction of the hollow of the sacrum, will rarely fail to disclose the position of the os—the difficulty being, of course, greater in first than in subsequent pregnancies, owing to the membranous thinness which the lips of the womb frequently, in these cases, assume.

In the practice of the *toucher*, or digital examination of the vagina, skill and experience are of paramount importance; and as it is by practice alone that the required dexterity can be attained, it behooves the student to avail himself of every opportunity which may arise for adding to his store of experience. With this view some uniform scheme or method of examination should be adopted. A long finger is doubtless an advantage, but the advantage is by some writers greatly exaggerated. The index finger may alone be used, but some prefer to use two, by which we no doubt gain something by the greater length of the second finger. This advantage, however, is frequently counterbalanced by the increased pain which the examination gives the woman, causing her to shrink and draw away from the hand of the accoucheur. The finger should be passed forward from the situation of the coccyx over the anus and the posterior commissure of the vagina. It may seem almost too ridiculous to suppose that the anus should in such an examination be mistaken for the vagina, but the knowledge of the fact that

the mistake has been committed will suffice to prevent the student from a similar error. The finger should be well oiled or smeared with lard, with the object in all cases of facilitating introduction, and in a certain class of cases to protect the finger. Notice is to be taken, as a matter of routine, of the state of the perineum, labia, and other parts. The condition of the vagina and rectum, and of the pelvic walls, must, in like manner, not be overlooked, for, in all questions bearing upon pregnancy, the state of these parts must have a special interest, and the timely recognition of anything abnormal may have the result of averting a calamitous result. In the actual examination of the os and cervix, some assistance will occasionally be derived from the use of the hand over the surface of the abdomen, by which the fundus may be steadied and the os pressed downwards more within the reach of the finger. In conducting such investigations as we have been referring to, the strictest caution must, in every instance, be exercised in order to obviate the possibility, which exists in every case, of premature labor being induced by rude and careless hands. The amount of irritation necessary to excite the uterus to contraction varies greatly in different cases, but we cannot doubt that incautious interference, more especially with the os and cervix, may incite contraction, and cause the loss of the product of conception.

In the investigation of uterine diseases unconnected with pregnancy, it is often proper to institute an examination *per anum*. In the practice of midwifery, and the diagnosis of pregnancy, such a mode of examination is very seldom necessary. Cases, however, do now and again occur, in which, owing, it may be, to excessive tenderness of the parts, or to partial obliteration of the vagina, the result of sloughing, we may be obliged to have recourse to this expedient. Or, again, it may be necessary for the proper examination of tumors, which exist as complications of pregnancy, and which are connected with the posterior part of the pelvis. And, in one other group of cases, we are recommended by Montgomery to examine thus, "when, for any particular reason, it is thought desirable to ascertain whether the uterus is enlarged within the first two months of supposed pregnancy." Under any circumstances, however, this mode of examination is so repulsive to the woman that, with that consideration for her feelings which should always sway us, we instinctively shrink from proposing it, unless the circumstances be such as to render it absolutely essential.

Quickening.—The period of Quickening is that at which the mother becomes for the first time conscious of the movements of the foetus within her womb. They who at one time believed that the ascent of the uterus from the pelvis to the abdominal cavity took place suddenly, and was not a simple process of gradual dilatation, held, naturally enough, the view that the quickening was this assumed sudden motion. Every woman now knows that it is due to the actual movements of the living child, which are at this period first communicated to her senses. The sensation, however, does not represent the first movements of the child, for they are seldom perceived by the mother earlier than the sixteenth week, whereas, in abortions at a much earlier period, vigorous movements have been observed after the expulsion of the embryo. Nor

is it an uncommon thing, in the course of an abdominal examination by the hands and the stethoscope, to feel or to hear slight movements which we can only suppose to be exercised by the fœtus, and that too at a time when the mother may still be in doubt as to the fact of her pregnancy.¹ The time usually stated as that of quickening is about the middle of pregnancy, or four and a half calendar months. This belief, although only a popular one, is sufficiently wide of the truth to call for correction. It is difficult, however, to fix upon a period as a safe average, as we know that the time of quickening may vary from the end of the second to the eighth month. In a very large majority of cases, about the seventeenth week may be assumed as the period at which women feel the first feeble flutterings which to them indicate the vitality of their offspring. In some instances, the movement is more decided, even at this time, but the rule is that it is at first very faint, and gradually becomes stronger in proportion as the development of the fœtus progresses. In the later months, the foetal movements become so vigorous, that they may cause the woman actual pain, and have been known to cause her to cry out; and, at this stage of pregnancy, the movements which are perceived are due to brisk flexion and extension of the joints of the lower limbs, the sensation being in some instances due to smart kicks, and in others to a continuous movement, such as might be caused by the passage of the knee along the inner uterine wall. Important as this sign is to the accoucheur, and all-important as it is to the woman, it is nevertheless one in regard to which we must always be cautious, as there are fallacies which may lead astray even those women who have previously borne children, and who may thus be supposed to be familiar with the sensation in question. The conditions which may give rise to such erroneous impressions are rapid movements of gas in the intestines, irregular contraction of the muscles of the bowels, or even of the muscles which form part of the abdominal walls, and the pulsatile movements of an aneurism, or of a large artery, which, being communicated to a tumor within the abdomen, may very readily deceive a woman who already suspects that she is pregnant. Such cases are so frequent, that we must always be careful in receiving in evidence the mere statement of the woman.

We have hitherto spoken only of the active movements of the fœtus, as observed by the mother. But these movements receive, as evidence of pregnancy, a vastly increased significance, if, in addition, the accoucheur is able to convince himself of their reality, which he generally can succeed in doing by careful abdominal palpation. The nature of the tumor, its symmetry, and its elasticity, will already have prepared him for the corroborative evidence which he expects, and a very

¹ It is now generally believed that the mother cannot be conscious of the foetal movements until the uterus comes in contact with the abdominal walls. It is then for the first time possible that the sensation can be transmitted by sensory fibres of the cerebro-spinal system ramifying in the abdominal parietes. This theory accounts, as it appears to us, quite satisfactorily, for the phenomena which exist; for we cannot doubt that the limbs of the child must strike the uterine walls at an earlier period than they are perceived by the mother, and it is not to be expected that the sensation could be communicated through the few filaments which reach the uterus from the cerebro-spinal system, as these are confined to the os and cervix.

French designation "Ballottement," which is, certainly, the more appropriate of the two. The following is the manner in which this test is usually applied: The woman is placed in a position which is intermediate between reclining and standing, and a very convenient plan is to have her shoulders supported behind, while she sits on the edge of the bed, with her feet upon the ground. The fundus uteri is then steadied by one hand, while the index finger of the other is introduced in the usual way into the vagina, with the palmar surface upwards. The finger thus placed is then brought into contact with the anterior segment of the uterus, near the cervix, where the presenting head of the child will generally be most easily felt. A smart jerk is given upwards, and the finger then kept perfectly steady, in its original situation, when, if the attempt be successful, it will be found that the foetus, which had risen up in the liquor amnii, in obedience to the impetus which had been given to it, falls, in a few seconds, back into its original place, and again gently poises itself upon the tip of the finger, communicating to it the peculiar sensation from which the test derives its name.

Although the posture above indicated is that in which the sign of ballottement is most readily recognized, it is by no means the only position in which it may be made out. A precisely similar sensation, indeed, is communicated when the woman lies upon her back, or even (although more rarely) when she occupies the ordinary obstetrical position on the left side. The same effect may also be produced in the course of abdominal palpation, about the fifth or sixth month, when, if the woman is placed upon her side, in the horizontal position, and one hand passed beneath the projection, there will be felt, if the abdominal walls are not too thick, some portion of the body of the foetus resting upon the hand. This, not unfrequently, may be displaced, and will return upon the fingers precisely in the same manner, and on the same principle, as when the examination is conducted in the usual way.

The sign of ballottement establishes the presence, in a fluid medium, of a solid body. This body must obviously be, on the one hand, of sufficient size to be perceptible to the sense of touch, and on the other, of a size considerably less than the cavity which contains it. It is clear that, unless these conditions are fulfilled, the sign is not available for the purposes of diagnosis. Of this proposition it is an obvious corollary, that it is only during a certain period of a pregnancy that ballottement can be distinguished. Before the fourth month, the size of the embryo is so small that it is impossible to produce the movement; but from this epoch till about the seventh month, it becomes more and more distinct. For a few weeks after this it may still be observed, although with greater difficulty; but, during the last six weeks, this method of examination gives no result whatever, in consequence of the great size of the child, and the extent to which the uterine cavity is filled by it. For a similar reason, it is not available in twin pregnancy. The only exceptions to this rule are cases in which the quantity of liquor amnii is greater than usual. Ballottement, in the hands of an experienced practitioner, may be looked upon as a certain proof

is often only after prolonged exploration that a point is discovered where the sounds are clearly audible; and, as we have already shown that the position of the child is more constant the nearer it is to the end of pregnancy, it follows that the earlier the period at which the examination is conducted, the greater will be the variety in the site at which auscultation has a successful result. It is usual, with the view of saving time and trouble, to adopt a uniform plan in conducting this investigation, beginning always at the point at which the sound, for well-known reasons, is most frequently to be distinguished. The child, as is known, lies in the womb, in a very large majority of cases, with the head downwards, and the back forwards and to the left, some portion of the back part of the trunk being thus brought into contact, almost invariably, with the uterine wall, somewhat to the *left* of the middle line. If we place the stethoscope over any portion of the uterus other than this, the layer of amnionic fluid which lies between our ear and the heart of the fœtus cuts off all acoustic communication; whereas, at the point just named, there is continuity of solid tissue, and through that the sound is conducted. The extent of the area over which the sounds are heard depends, in a great measure, on the quantity of the liquor amnii, being greatest when it is scanty, while, with much liquid, a small portion only of the fœtal trunk comes into contact with the uterine wall, and the area is thus proportionally small. The point, therefore, at which we have the best chance of at once catching the sound, is about midway between the umbilicus and the symphysis pubis, and somewhat to the left side. If the child is in what will be described afterwards as the second cranial position, the back being thus forwards and to the right, we may expect to hear the sound at a corresponding point to the *right* of the middle line. In dorso-posterior positions, whether of the head or of the breech, the convexity of the spinal column being turned backwards sometimes constitutes a difficulty in auscultation, as is also created by an unusual quantity of the liquor amnii (Dropsy of the amnion), and by various abnormal positions of the child. If, however, an examination conducted with due care at any time after the fifth month, and in the course of which the whole of the abdominal surface has been carefully explored, fails to detect the fœtal pulse, this, of itself, is very strong evidence either that pregnancy does not exist, or, if it has existed, that the fœtus is dead.

It is generally believed to be possible to determine, by means of stethoscopic examination, the existence of a twin pregnancy by the following peculiarities: that, in twin pregnancies, the two hearts are heard beating at opposite points of the abdomen, and that they are frequently not synchronous in their action. If the latter point can be conclusively established by the simultaneous examination of two observers, the case is clear; but, in regard to the mere existence of pulsation at two opposite points of the abdomen, this cannot be admitted as satisfactory proof. It has, by some, been asserted that the distinction is easy, and that, when we have pulsation at two points, in a single pregnancy, the sounds reach their greatest intensity midway between the two; whereas, in a twin pregnancy, examination in the intermediate area gives a negative result. This, if true, would be a

sure and easy test ; but we are perfectly certain it is not to be relied upon, although it may represent the general rule. Still, taken along with the shape of the abdomen, pulsation at two points is an important symptom in the diagnosis of twins, which are generally placed to the right and left in the womb.

Funic Souffle.—Dr. E. Kennedy has described another stethoscopic sound, which is synchronous with the foetal heart. “In some cases,” says he, “where the uterus and the parietes of the abdomen were extremely thin, I have been able to distinguish the funis to the touch externally, and felt it rolling distinctly under my finger, and then, on applying the stethoscope, its pulsations have been discoverable, remarkably strong ; and on making pressure with the finger for a moment on that part of the funis which passed towards the umbilicus of the child, I have been able to render the pulsations less and less distinct, and even, on making the pressure sufficiently strong, to stop it altogether.” This assertion of Dr. Kennedy’s has been vigorously controverted in Germany ; but, even admitting the description to be absolutely correct, the observation is one, as has been well observed by Dr. Tyler Smith, “which can hardly be of practical use, because, when the abdominal and uterine walls are so thin as to permit us to feel the pulsation of the funis through them, the other auscultatory signs of pregnancy, and the evidence obtained by palpation, must already have set the question at rest ; and, except under such circumstances, it must be very difficult to discover the funicular soufflet.”

Uterine Souffle.—The “bruit de souffle,” “placental souffle,” and Uterine Souffle, are among the most familiar of the designations which have been applied to another and an important auscultatory sign, which was originally discovered, in 1823, by M. De Kergaradec, but for whom, also, the more important observation of M. Mayor would have been overlooked. The various names by which the souffle is described point pretty clearly to the well-known fact, that speculations as to its nature and its cause have given rise to various theories, which display the existence of very contradictory opinions. All agree that the sound is maternal, not foetal, as its rhythm corresponds to that of the maternal heart. The universal acceptation of the term “souffle” shows that, in regard to the nature of the sound, observers are at one. But, in so far as its seat and mode of production are concerned, great divergence of opinion has existed.

The Uterine Souffle, as, for reasons to be stated presently, and following Dubois, we prefer to call it, is distinguishable at an earlier period than the foetal pulsation. Dr. Kennedy, who has given much attention to this, as to the other signs of pregnancy, maintains that he has heard it as early as the tenth week ; but, usually, it is not till the sixteenth week, or even later,—or, in other words, until the uterus is accessible to the stethoscope,—that it can be made out. These remarks apply to examination through the abdominal walls, for if the metroscope of M. Nauche be used, it is possible that it may be heard at a somewhat earlier period. An occasional characteristic of the sound is that it is not constant. It may be distinctly audible at one moment, and may disappear the next, to return again in a short time,—these changes

taking place without any appreciable cause. In some cases, it is heard over the whole abdomen ; while, in others, it is confined within a limited boundary, usually in the region of the groins. Generally it is heard, in advanced pregnancy, over the whole of the lower part of the uterus, but not over the fundus, nor in the lumbar region ; but, in the earlier months, it may be heard over the symphysis, or wherever the uterus is accessible to the stethoscope. In regard to tone and pitch, the varieties are endless,—presenting, in fact, from the soft whiff to the musical cooing or rasping sound, all the peculiarities of aneurismal or cardiac murmurs ; and, what is not a little remarkable, it varies, in this respect, not only in different individuals, but in the same individual at different times.

If the observation be made during a labor pain, a very striking effect is often found to be produced by the contraction of the uterine fibres, the sound becoming, in the first instance, louder, more sibilant, or even musical, and then, at the height of the pain, becoming lost—to return, as it passes off, in the inverted order of the tones, as the pressure on the vessels is relaxed. It seems to have no fixed relation to the site of the placenta, and it certainly gives no reliable evidence, as might, perhaps, have been expected, as to where the placenta is situated in the uterus. The uterine souffle as a sign of pregnancy, is, no doubt, extremely valuable, and is to be distinguished from any other arterial sound by the absence of impulse, and its persistence in every posture ; but it must, on no account, be admitted as a certain sign. For, the attention which has of late years been given to the diagnosis of ovarian tumors has shown that one of the most constant signs of a pathological uterine tumor, and which goes far to distinguish it from a similar structure which has sprung from the ovary, is the existence of a souffle, which has the closest possible resemblance to the souffle of the pregnant womb.¹ Under no circumstances is the uterine souffle to be held as proof of the life of the child.

A certain number of observers were long of opinion that the sound which we are now considering was caused by pressure on the great arterial trunks which lie in the posterior part of the pelvis. This must at once be admitted as a possible cause of such a sound, seeing that pressure on vessels in any situation may produce a souffle. But that this is not the case in pregnancy, seems to be proved by the fact, that such a change of posture (the prone position, for example), as would remove the uterus for the time being from the neighborhood of the vessels, never has the slightest effect in arresting the souffle. The view which was entertained by M. Kergaradec himself, in regard to the production of the sound, was that it was produced in the utero-placental vessels, and on this account he named it the “bruit placentaire.” That it is not so, is now universally admitted, and the idea was, indeed, completely refuted by the discovery that the sound is heard at so many various sites, and still more conclusively by the observations which

¹ Many believe this to be due merely to pressure on neighboring large vessels. Sometimes it is so ; but, we are persuaded that the cause of the sound is generally in the uterine walls.

1. The Sounds produced by the Pulsations of the Foetal Heart.
2. The Active Movements of the child, distinctly felt *by a skilled person*.
3. The Passive Movements, in which consists the sign of Ballotement.

If any one of these signs is made out, the woman is incontestably pregnant. But, in regard to the negative evidence which is afforded by their absence, this can only be admitted as proof that the woman is not pregnant when the other signs are wanting: the absence of one is only sufficient to warrant a doubt. To the three certain signs given above, we might, perhaps, add a fourth—the secondary areola of Montgomery; but, as this is open to doubt, and is only to be observed in a limited number of cases, we include it among the probable signs.

It is quite unnecessary that the latter should be again enumerated. Singly they are of no value; but, when a considerable number of them are simultaneously observed, in cases where pregnancy is expected, as in married women, the evidence thus afforded is tacitly admitted as complete. For such a diagnosis the medical attendant should not be held responsible; but, if it turns out, after all, to be a mistake, he will find that, in accounting for the blunder, a large share of the blame will lie at his door. For a certain opinion, such as one would be warranted in giving upon oath in a court of justice, no combination of merely probable signs will suffice. In addition to these, however imposing their array, we must, in every case, have one at least of the certain signs, before we can, with all confidence, assert that the woman bears a living child.

If the child is dead, it is obvious that two out of the three signs are no longer available; but, in these cases, there may still be ballottement, or there may be present signs which are held to indicate the death of the foetus, and which will be noticed in their proper place. The questions may be put to us: Is pregnancy probable in this case? or, Can you say with perfect confidence that the woman is not pregnant? The reply to such questions must be given with the greatest caution, and will depend very much on the correct appreciation of the various probable signs, and the exact value which attaches to each, or to each group of such signs. In most cases of doubt, some period will be given as the probable or possible time from which, if existing, the pregnancy must date; and it will be upon a careful analysis of the signs proper to such period of pregnancy as may thus be indicated, that our opinions will, in the end, be formed. With a view of facilitating such an investigation, the following table has been drawn up, in which is given the average period at which the various signs are available.

TABLE SHOWING THE SIGNS OF PREGNANCY AT VARIOUS EPOCHS.

Weeks.	Disturbance and Alteration of Function.	Position and Anatomical Relations of the Uterus.	Condition of the Os and Cervix. 1. In Primiparæ; 2. In Pluriparæ.	Special Characteristics.
1st to 8th.	Suppression of Menses (occasional exceptions). Swelling and pain in Breasts. Morning sickness, and other digestive derangements.	Volume and weight increased: Lower in pelvis: Os displaced downwards. Very slight hypogastric flattening and depression of Umbilicus. Fundus still below the level of the finger. the pelvic brim.	Investing mucous membrane becomes thick and oedematous. Os in Primiparæ becomes round; in Pluriparæ it is more open, and admits the point of the finger.	Turgescence and increased temperature of external genitals and of Vagina, the mucous membrane of which becomes darker.
9th to 16th.	Marked enlargement of Breasts, with prominence of nipple, and slight deepening in color of the Areola.	Fundus passes brim about 12th week, and is midway between the pubis and umbilicus at end of 16th. It is distinguished by palpation and percussion. Less depression of Umbilicus, and less hypogastric flattening. Os reached with more difficulty, and is situated somewhat to the left.	Softening extends gradually from mucous membrane to tissue. Orifice closed in Primiparæ; in Pluriparæ still more open.	Uterine souffle about 16th week.
17th to 24th.	Areola becomes distinct, the follicles projecting beyond the level of the skin. Morning sickness, and other digestive disturbances less. Certain effects of mechanical compression now often observed, such as varicose veins, and oedema of the genitals.	Fundus gradually rises; is a little beneath the umbilicus at the 20th, and a little above it at the 24th week. Rounded central tumor in hypogaster, becoming gradually more apparent. Umbilical depression almost effaced. Os and Cervix still higher.	Softening further invades the cervix. In Primiparæ, os circular, smooth, and closed. In Pluriparæ, irregular, nodulated, and usually admitting, without difficulty, the point of the finger.	Projections of fœtus may be felt. Active movements may be experienced by mother about the 17th week, and felt by the accoucheur some weeks later. Pulsation of fœtal heart about 18th week. If the head presents, Ballotement can be made out about the 18th week. Dark lines on abdomen; and secondary areola may also be observed.

25th to 32d.	<p>Deeper color of the Areolæ, with complete development of the glandular Follicles.</p> <p>Morning sickness rare.</p> <p>Effects of mechanical compression more marked.</p> <p>Vagina often granular, with leucorrhœal discharge.</p>	<p>Fundus at 28th week about two inches, and at 32d three inches above umbilicus.</p> <p>Uterine tumor larger, and directed to the right side.</p> <p>Umbilical depression completely effaced.</p> <p>Os and Cervix still ascending, and directed backwards, and a little to the left.</p>	<p>Softening of Cervix complete.</p> <p>In Primiparæ, the os internum yields, and the cavity of the cervix becomes encroached upon from above.</p> <p>In Pluriparæ, os internum remains closed, but the cavity of the cervix admits the finger with ease.</p>	<p>All the above conditions become more intensified and obvious.</p>
33d to 38th.	<p>Disorders of Digestion and Respiration, the result of pressure by the distended uterus.</p>	<p>Fundus rises as high as the ensiform cartilage, and on each side is behind the false ribs.</p> <p>Umbilicus inverted, and protruding.</p> <p>Os reaches its highest point.</p> <p>Inferior segment of uterus becomes thinner, so that the presenting part of the child can be more easily felt.</p>	<p>In Primiparæ, marked and progressive shortening of cervical cavity, which, about 34th week, has lost half its length. External os admits point of finger.</p> <p>In Pluriparæ, internal os only yields at 36th week, when the shortening of the cavity rapidly progresses. Lips of os thick and soft, and admitting the finger as far as the membranes.</p>	<p>As in the 7th and 8th month—with the exception of Ballotement, which becomes impossible.</p>
39th and 40th.	<p>Functional disorders disappear.</p> <p>Edema and varicose condition of genitals increased.</p> <p>Pain and difficulty in walking.</p>	<p>Fundus falls downwards and forwards, the Os moving at the same time downwards and backwards in the true pelvis.</p> <p>Prominence of umbilicus reaches its maximum.</p> <p>Presenting part very distinct, and low in pelvis.</p>	<p>In Primiparæ, the cervix completely disappears; the lips become very thin, and almost membranous. The os opens a little.</p> <p>In Pluriparæ, the lips remain irregular, and of considerable thickness to the last.</p>	<p>All the appearances due to stretching of the abdominal parietes become more distinct.</p>

CHAPTER X.

DURATION OF PREGNANCY—SUPERFŒTATION, . . . . .	174

DURATION OF PREGNANCY: IN COWS AND MARES: IN WOMEN—PROTRACTED PREGNANCY: CASES OF—DIFFERENCE IN RATE OF DEVELOPMENT—MODE OF CALCULATING THE PROBABLE TIME OF DELIVERY: CALCULATION FROM LAST MENSTRUATION TO BE CORRECTED BY PERIOD OF QUICKENING—SUPERFŒTATION: TO BE DISTINGUISHED FROM SUPERFŒCUNDATION—PROOFS OF THE LATTER—TWIN PREGNANCY IN RELATION TO THIS SUBJECT—CASES—CONCLUSIONS.

THE Duration of Pregnancy is a subject which, in so far as regards the human race, is enveloped in no little obscurity. Our chief difficulty arises from the fact, that it is only in a very small number of cases that the date of fertile coitus can be accurately ascertained; and, further, in the majority of these, it is probable that the data are open to doubt: for example, when an unmarried girl says she is pregnant from a single coitus, may we not suspect that she does so to palliate her fault, as she can no longer conceal her shame? and the more closely, indeed, do we investigate this class of cases, the more convinced do we become that many instances of so-called pregnancy from a single act should not be admitted in evidence. The proof, however, which is afforded by undoubted cases of this nature, and that which is derived from other sources, is sufficient to show that there is a very considerable difference in the duration of pregnancy, consistent with maturity of the fœtus and a normal state of the pregnancy from first to last.

In all the Mammalia except Man, one coitus coinciding, as it does, with the period of rut, is generally followed by conception. This admits of observations of an exact kind in the case of many of our domestic animals; by means of which, indeed, much of what is known in this domain of physiology has been, in a great measure, established. In 1819, M. Tessier submitted to the Académie des Sciences at Paris the result of a series of investigations of this nature, which are of some interest as illustrating by the light of comparative physiology the question which we are now considering. The observations were, in fact, instituted with the object of determining the possibility of protracted gestation in the human race. The following are the leading results:

OF 140 Cows:

14 calved between the 241st and the 266th day.					
53	"	"	269th	"	280th "
68	"	"	280th	"	290th "
5	"	"	290th	"	308th "

The extreme difference between the births, in an animal in which gestation is only a little more protracted than in women, being thus 67

days. An extended series of observations of a similar nature, and yielding similar results, was conducted by the late Lord Spencer:

OF 102 MARKS:

8	foaled on the	311th day.
1	" "	314th "
1	" "	325th "
1	" "	326th "
2	" "	330th "
47	" between the	340th and the 350th day.
25	" " "	356th " 360th "
21	" " "	360th " 377th "
1	" on the	394th day.

the extremes in this case embracing a period of no less than 83 days.

Of course, as regards the cases in which the birth took place much earlier than the ordinary period, it may be said that they were examples of premature delivery; but even if, by striking them off, we remove this possible fallacy, there still remains a sufficiency of facts to prove that, in those animals, there is considerable latitude as to the exact day at which labor may be anticipated. And, if this be the case in animals, where sexual excitement is in abeyance during the whole period of gestation, is it not even more likely to obtain in the case of women, in whom sexual excitement persists, and who are exposed to moral and social influences, and to diseases, one and all of which may act as disturbing influences, and thus cause irregularities in the period of delivery? And, in point of fact, this has been shown to be the case, by numerous examples which have been carefully noted by experienced observers. The usual method of determining the approximate duration of pregnancy, it being impossible to fix the date of conception, is to make the calculation from the last day on which the menstrual discharge was observed. It was upon this principle, and selecting those cases only in which this starting-point could be exactly determined, that Dr. Merri-man conducted his investigations, with the results which are quoted in almost every work on obstetrics. Of the 150 mature births observed by him—

5	were delivered in the	37th week	—255 to 259 days.
16	" "	38th "	—260 to 266 "
21	" "	39th "	—267 to 273 "
46	" "	40th "	—274 to 280 "
28	" "	41st "	—281 to 287 "
18	" "	42d "	—288 to 294 "
11	" "	43d "	—295 to 301 "
5	" "	44th,	the latest being the 306th day.

In this most interesting and reliable table a difference is shown between the extremes of 51 days. The following table, of no less than 500 cases, by Dr. James Reid, is of no less interest, and is calculated like that of Merri-man from the last day of menstruation.

Of the 500 cases

23	were delivered in the	37th week	—255 to 259 days.
48	" "	38th "	—260 to 266 "
81	" "	39th "	—267 to 273 "
131	" "	40th "	—274 to 280 "
112	" "	41st "	—281 to 287 "
63	" "	42d "	—288 to 294 "
28	" "	43d "	—295 to 301 "
8	" "	44th "	—302 to 308 "
6	" "	45th "	—309 to 315 "

The difference between the extremes being in this case no less than 60 days.

The results yielded by these two tables prove that, calculating in this manner from the last day of the last menstruation, considerable variations in the duration of pregnancy seem to occur. But such seeming variations must be viewed with caution. Our calculation is not here, as in cows and mares, from the very day and hour of coition, but is made in full knowledge of the fact that conception may have occurred on any one day of a period extending over more than three weeks. Such conclusions as may be admitted, upon an analysis of the cases of single coitus in the human species which are on record, tend to show pretty clearly that, although the range is less than in the lower animals, there is an undoubted variation within certain limits. Dr. Reid, in the series of papers from which the above table was taken, gives an analysis of 43 cases of single coitus which he had collected; but as we entertain grave doubts of the accuracy of such tables, for reasons already stated, we refrain from quoting it *in extenso*. According to it, delivery took place in from 260 to 300 days, a range of no less than 40 days, and the average duration of gestation is shown to be about 275 days.

The facts above cited seem to show that the question of the duration of pregnancy is one which is of the highest importance, not only in an obstetrical, but in a legal sense; and it is indeed upon the facts established by scientific and obstetrical research, and the opinions which are founded upon them, that the laws bearing upon the subject have been framed, and are interpreted in courts of law. One of the most interesting cases of this kind on record is the well-known Gardner peerage case, of which the following is a brief outline:

"Lord Gardner parted from his wife on board of his ship on the 30th of January, 1802, and, having proceeded to the West Indies, did not see her again until the 11th of July following. Lady Gardner had been living in open adulterous intercourse with a Mr. Jadis, and on that account his Lordship obtained a divorce after his return, and subsequently contracted a second marriage. The case came before the House of Lords in 1825, when Allan Legge Gardner, the son of Lord Gardner, by his second wife, petitioned to have his name inscribed as a peer on the Parliament Roll. Another claimant, however, appeared in the person of Henry Fenton Jadis or Gardner, who alleged that he was the son of Lord Gardner, by his first, and subsequently divorced wife. He was proved to have been born on the 8th of December, 1802, and the question in view of the above facts simply was (as the possibility of the pregnancy dating from July was not put forward), whether a child born 311 days from possible intercourse, could have been the child of the deceased Lord Gardner. The medical evidence, as, unfortunately, it too often is in such cases, was very contradictory, but is particularly interesting as bringing out the opinions of the greatest obstetrical authorities of the day. Sir C. Clarke, Dr. Gooch, and Dr. Davis stated their belief that forty weeks (280 days) is never exceeded, while on the other hand, Drs. Blundell, Conquest, and Granville asserted that the period was in some cases undoubtedly exceeded, and to such an extent that they were warranted in admitting the possibility of the claimant, Henry Fenton Jadis, having been a ten and a half months child. Their Lordships found that the elder claimant was illegitimate, and that, consequently, the son of the second marriage was Lord Gardner. It must be admitted, however, that the moral evidence in this case had probably more weight than the medical."

Since this decision, the attention of the profession has been much more carefully directed to this subject, and probably no one at the present day would venture to assert that 280 days is the *ultimum tempus*

pariendi which some legal authorities suppose it to be. Were we able to date from the moment of conception, which under no circumstances is possible to us, we could soon collect sufficient data to guide us in future. But we must not forget that, even in those cases in which the calculation is made from a single coitus, the time of insemination does not necessarily mark the time of fecundation, and there is good reason to believe, from what has been observed in the lower animals, that some days may elapse before the fertilizing principle encounters the ovum. Then, again, if we date from menstruation, we must admit the possibility of irregular menstruation prior to impregnation, in which case conception may occur six weeks or more after the last menstruation. And if we admit this, as we tacitly do in cases of married women who carry the child longer than usual, we are bound in common fairness to allow the same argument to those who wish to prove the possibility of protracted pregnancy. The following instance, from the writer's case-book, will serve to illustrate this:

"Mrs. P., who before had borne one child, ceased to menstruate on the 11th of September. On the 23d of December, she had slight hemorrhage and other symptoms of threatened abortion. Nothing solid came away, and she was confined strictly to bed until all the symptoms had disappeared. Previous to this she had had morning sickness. In the course of the month of February, she felt motion, but did not note the date. Development went on as usual, and she enjoyed excellent health.

"On the 17th of July I visited her, being somewhat astonished at the duration of the pregnancy. On examination I felt the outline and feet of the child quite distinctly, the latter moving vigorously in the right hypochondriac region, where the movements had subjected the mother to much annoyance. The os uteri was patent, so as to admit the point of the finger, and was quite cushiony and soft. The cervix was short, but quite perceptible. The presenting part could not be reached by the finger. On the 22d of July, 314 days from the last menstruation, a male child was born of average size and quite healthy."

In this case menstruation was habitually irregular, and there was often an interval of six weeks between the periods. If we assume therefore that impregnation occurred immediately before a menstrual period after an interval of six weeks (42 days), this would make the duration of pregnancy exactly 273 days.

The following case is of a somewhat similar nature, but is further interesting as affording an illustration of what we believe to be in many cases an essential element in determining the probable duration of pregnancy. The sensation of quickening is generally, as has been observed, perceived by the mother a little before the middle of pregnancy, and should always be accurately noted if possible. Were this done in every case, it would serve to correct errors which may arise from calculations based exclusively on the last menstruation. Had it been done in the following instance, some trouble and anxiety might have been saved, and the same remark might possibly apply with equal force to many of the so-called examples of protracted gestation:

Mrs. M., who had previously borne eight children, ceased to menstruate on the 13th of September. For some months after this she suffered much from spasmodic asthma, which seemed to be associated with the pregnancy, of the existence of which she was for some time doubtful. The movements were said to be less vigorous on this than they had been on former occasions, but in all other respects she progressed very favorably, the asthma becoming much less in proportion to the advance made

in the pregnancy. The calculated time having long passed, and a more careful questioning having been adopted, it was found that quickening dated *from the first week in March at soonest*. Only one menstruation had occurred since her former pregnancy.

July 24th.—On examination, the os is found to be patent. A few pains have occurred. Head easily reached and presenting.

July 31st.—Child born at 5 A.M., 322 days from the last menstruation.

If impregnation had not occurred in this case, we may suppose it possible, if not probable, that the second menstrual period after the former confinement would have taken place between six and seven weeks after the first, and that impregnation had occurred immediately before it—say on the 24th of October, or 280 days before birth.

The last case which we shall cite in illustration of this subject is one of special interest, inasmuch as it is calculated from a single coitus under circumstances which leave no room for doubt as to the facts, and in which the pregnancy was unusually prolonged:

The subject of the case in question, Mrs. R., had previously had seven children, one having been a transverse presentation, and several having been delivered with the forceps. Her general health being indifferent, she dreaded greatly another pregnancy, and on that account absented herself from her husband's bed. In the month of March the latter went on a visit to the country, where Mrs. R. visited him for a single night, circumstances having arisen which obliged her to go to the Continent, where she remained for two months. The date of this visit was the 2d of April, and before her return home she was convinced by previous experience that she was pregnant. The date of the last menstruation was a little uncertain, but was about the 27th of March. To the astonishment of every one who knew the circumstances the pregnancy continued far beyond the ordinary limits, until, on the 22d of January, she was delivered of a very large male child, weighing 12 lb. 3 oz., 295 days from what we believe to have been beyond all doubt a solitary coitus. An interesting point in the case was the great size of the child, indicating, as it might be, that it had been retained within the womb beyond the ordinary period of maturity.

Many writers, among them Scanzoni, maintain, and some observations seem to confirm their view, that the rate of intra-uterine development is not always the same; and that children born mature at an earlier period than usual are to be described as exceptional (*Graviditas Præcox*), while the contrary class of cases are those in which, development being slow, maturity is not reached until a period considerably beyond the average (*Graviditas Serotina*).

The facts just stated furnish a general confirmation of the observations of those whose conclusions are embodied in the tables which we have given. The maximum, according to Reid, is 293 days, as deduced from his cases of single coitus; our own case above quoted is 295; and Merriman's maximum of 306 days from the last menstruation, will, if calculated from the probable time of conception, give about the same result. In Scottish Law, and in the French Code, the period of 300 days is fixed as the utmost possible limit, and in Prussia 301, so that in these countries the child of a woman who is delivered 302 days after the death or proved absence of her husband is declared illegitimate. Difficult as it is, and always must be, to fix precisely the limit, we are inclined to think that these laws are just; for while it is the object of the law from one point of view to protect the innocent offspring from the brand of illegitimacy, if it be possible to do so, it is in like manner the duty of those who administer the law, not rashly to confer the

position and privileges of legitimacy upon the fruit of adulterous intercourse. In English Law, no period or limit is fixed, and cases when they arise fall to be decided in the light of the medical evidence or experts, and of the moral and collateral aspects of the case. In America, a more liberal view is taken, to judge from some legal decisions which are quoted by Taylor, where paternity was held to be proved in two cases, the duration of the pregnancy from coition being shown in one to be 313, and in the other 317 days. It is possible that the American views on this subject may have received their color from the extreme views entertained by one of the most eminent obstetricians in that country, Dr. Meigs, of Philadelphia, who has expressed a belief that gestation might continue for a year or even more.

With reference to what has been said as to the probability of 300 days being a liberal interpretation of a law of nature, it must not be forgotten that some very able obstetricians in this country have expressed a contrary opinion. The names of Simpson and Murphy are a sufficient guarantee that the cases cited by them, on which they found their opinion that pregnancy may be prolonged considerably beyond the period named above, are free from the suspicion of careless investigation; but, on the whole evidence before us, we conclude that the extreme cases must be disallowed, as the sources of fallacy are too numerous to warrant us, without clear evidence, to sanction the extension of the possible limit.¹

Speaking in general terms, pregnancy may be stated as lasting, under ordinary circumstances, for nine calendar months,—from 273 to 276 days, according to the length of the months which intervene. But, as we are ignorant of the date of conception, and can only make the above calculation under very exceptional circumstances, some other mode has to be adopted in practice. It is a matter of some importance to the practitioner, and one on which his comfort in no small measure depends, to be able to forecast his obstetrical engagements; and this subject is on that account, to him one of special interest. A long series of careful examinations conducted by independent observers, seems clearly to show that the period of impregnation is usually about a week after the cessa-

¹ Some reliable information, in regard to this subject, may, as we believe, be derived from the observation of pregnancy in Jewish women. The author is mainly indebted to a very able physician and accoucheur of that persuasion for the following information. Among Jews, the sexes are separate during menstruation, and for seven clear days thereafter. The shortest period allowed for menstruation is five days, even should it last only for an hour or two, so that the *minimum* period of separation every month is twelve days: and, in anything approaching menorrhagia, of course much longer. This law is observed by the vast bulk of the Jewish women; the exceptions are very few. After the period of separation, whatever that may be, the woman, besides an ordinary bath for cleansing purposes, must take what is called the "bath of purification." She simply dips in this, but does not wash. This gives a fixed day, from which a Jewish woman reckons, as she knows the day she went to the bath, and calculates accordingly. Any one who may have an opportunity of making observations in this direction, will find, 1st, that Jewish women calculate more accurately as to the duration of pregnancy; 2d, that, according to their experience, the duration of pregnancy seems to be rather less than is usually supposed; and 3d (although this has less to do with the subject more immediately under consideration), that, as has been observed by a late writer in Germany, this frequent and protracted abstention from sexual intercourse may be admitted as a possible cause of the undoubted vitality of the Jewish race.

tion of a menstrual period. A ready method of reckoning, which is founded on this belief, is recommended by many German authors, and is very generally practiced by nurses in this country. It consists in taking the date of the last menstruation, reckoning three months back, and adding seven days. For example, a woman has ceased to menstruate on the 8th of June; three months back (or nine months forwards), gives the 8th of March; to this add seven days = 15th of March, which will be found, in a large number of cases, to be within a few days of the actual time of delivery.

For greater exactness, as well as for the purposes of general scientific accuracy, it is better to make the calculation in such a manner as may enable us to compare one case with another, and at the same time reduce possible error to a minimum. This is done by calculating in each case 280 days, or ten lunar months, from the last menstruation, which is equivalent (by deducting seven days) to nine calendar months from the assumed date of conception. This calculation, simple as it is, implies a certain amount of trouble, to reduce which various tables have been constructed. Such tables, however, as are given by Naegele, or by Murphy, after Dr. Ryan, are too elaborate to be of any real practical everyday use, and to read them requires almost as much trouble as to make the original calculation in each case. A much more useful and satisfactory one is the following, which is very easily read, and from which the calculation necessary may be made in a few seconds.

Around the circle are arranged in their order the months in the year, with the number of days in each. The number placed below each month gives the number of days which must be added to the nine preceding months in order to make up 280 days. If the month of February in a leap year is included in a pregnancy, it is estimated by the number in brackets.

We reckon, in order to find the next 280 days from the starting-point (the last day of menstruation), nine months forwards (or, more simply, three months backwards), and add to the date thus reached the number standing below the name of that month.

Example 1.—Last menstruation, the 10th of February, count three months back = November 10th + 7 = November 17th (in leap year, November 10th + 6 = November 16th).

Example 2.—Last menstruation, 24th March, = 29th December, = 280 days.

Example 3.—Last menstruation, 30th September, 1863, = July 7th, 1864, = 280 days.

Example 4.—Last menstruation, 31st May, 1863, = March 7th, 1864, = 280 days.

The last example shows how to proceed when, at the end of the month, there may be a doubt as to the calculation.

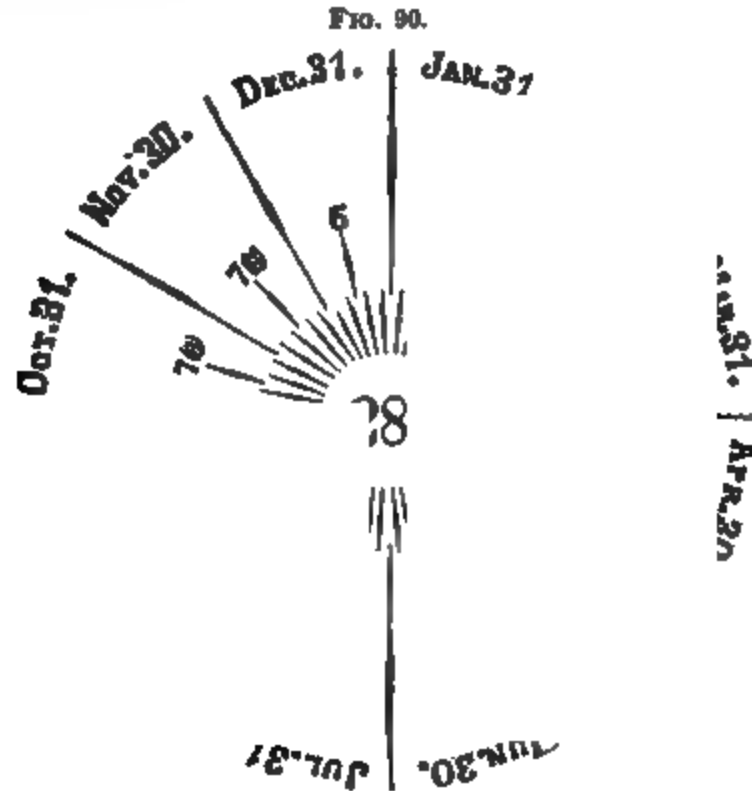
The 31st of February is equivalent to the 3d of March, which + 4 = 280 days.

An equally simple calculation may be made when, in medico-legal investigations, we want to calculate backwards from the day of birth to the probable cessation of the menses 280 days previously. In this

case, we count three months forwards, and *subtract* the number standing under the birth month.

Example 1.—Birth, 31st October, = Menses, January 31st,—7 = January 24th, or 280 days.

Example 2.—Birth, 20th April = Menses, July 20th,—6 = July 14th, = 280 days.



To calculate the duration of pregnancy. (After Schultze.)

Impregnation may take place at any time during an intermenstrual period. It is agreed, however, that the time at which it most frequently occurs is about seven days after the last menstruation, that next in point of frequency being immediately before the succeeding menstrual period. It will be observed that we have thus a range of three weeks within which impregnation *may* occur, even when the menstruation is quite regular, and this fact serves to explain, as we believe, the great majority of those cases in which a woman appears to carry the child for three weeks beyond the calculated time. Indeed, when a woman goes one week beyond the 280 days, we have come to look upon it in practice as by no means unlikely that she will carry her child for fourteen days more.¹

The errors which arise from this method of calculation are of such frequent occurrence, that we find it of great advantage, when practicable, to correct this observation by another, as has already been incidentally observed,—to wit the quickening. In regard to this sign of pregnancy, there certainly exists much self-deception on the part of women, and, moreover, it is, as Dr. Reid remarks, seldom that they can tell us the exact day on which they first feel it. The vulgar

¹ This term of 280 days is of special interest from another point of view, as taking the tenth menstrual period from conception. (See "Causes of Labor," Chapter XV.)

belief is that the period when it is first felt indicates the middle of pregnancy, or four and a half calendar months, but the opinion of the most experienced accoucheurs is that it is, as a rule, perceived about the end of the fourth calendar month, or about a fortnight before the middle of the term. About the seventeenth or eighteenth week, therefore, may be set down as the most usual period. Its value, as a sign of the duration of pregnancy, is unfortunately much diminished by the long period during which it may for the first time be experienced; but, still, its value is very considerable in this way, that, if we have a case to deal with of apparently protracted pregnancy, it is unlikely that any considerable error should arise both from the quickening and the menstruation in the same case. By this precaution, therefore, the risk of miscalculation is certainly diminished.

When, as is usual in midwifery practice, the services of the accoucheur are engaged beforehand, he should, for his own satisfaction, uniformly ascertain the date of the last menstrual flow, and not be content with the scanty information usually given that she expects her confinement "early in the year," or "about the middle of June." Having ascertained the fact and noted it, he must then inquire as to the quickening, and if the information is sufficiently clear, he must note that also. Or, if the woman has not yet arrived at the period of her pregnancy when this sign manifests itself, she must be requested to make an accurate note of her quickening, with a view to the subsequent information of her medical attendant. With the facts thus disclosed before him, he may then, by an application of the principles already laid down, make a calculation which, with ordinary care and discrimination, will rarely mislead him.

Superfoetation.—It is generally, although not universally, admitted by those who have devoted most attention to the subject, that it is quite possible for one impregnation to succeed another, in the same pregnancy, within a certain limited period, and it is all but proved that, in this manner, twin pregnancies do occasionally occur. This is, however, not superfoetation, but merely *superfecundation*; the essential distinction between the two being, according to Scanzoni, that the former must be held as occurring after the formation of the decidua, while the other is presumed to occur before that membrane is developed. Under the head of superfecundation we must class those cases, of which many are on record, of women who have borne twins of different colors, after having had connection successively with a negro and a white man. A case of this kind was reported in the *Philadelphia Medical Examiner*. Scanzoni, who rejects even the idea of superfecundation, explains such cases on the principle that children sometimes resemble the father, and, at other times, the mother, both in features and complexion. In twin pregnancies, one child occasionally resembles the father, while the other resembles the mother. It seems, on this ground, quite possible to him that all that is necessary for the production of a black child and a white one is cohabitation between a black man and a white woman; or, what is vastly more common, a white man and a black woman. Few, however, appear to agree with Scanzoni in his view; and, as we have already said, the possibility of superfecundation is, in

consequence chiefly of what we know from comparative physiology, pretty generally admitted.

It is otherwise with Superfoetation, the possibility of which has been vigorously opposed by Wagner, who termed it a physiological impossibility; and by most of the modern English writers, among whom we may mention Drs. Ramsbotham and Churchill. The idea implied is, that a woman who already bears within her womb a living foetus may, at a stage of pregnancy more or less advanced, again conceive, and thus carry simultaneously the fruit of two conceptions, between which there must be a considerable interval. A careful analysis of the so-called cases of superfoetation, and especially of the older cases, shows conclusively that, in most of them, the phenomena were quite consistent with the idea of ordinary twin pregnancy. Numerous cases are on record where, abortion having taken place, one twin has then been expelled, while the other has gone to the full time. Others, again, occasionally occur in which a mature child and a small withered one are born together. But it needs no argument to show that, although instances such as these may excite surprise among the ignorant, they are quite in keeping with what is known of the physiology of twin pregnancy. A number of the recorded cases are so obviously to be accounted for in this way, that we are almost tempted to refer, without any further investigation, all such to the same category. But an impartial consideration of the numerous examples which have been advanced in support of superfoetation will not permit such a summary treatment of the subject.

Among the cases frequently quoted is one which was published in the "Transactions of the College of Physicians."

"Mrs. T., an Italian lady, who was married to an Englishman, was delivered of a male child at Palermo, on the 12th of November, 1807; and on the 2d of February, 1808, she was delivered of a second male child." Both children were said to have been born perfect, but a careful analysis of the whole facts as disclosed seems to show that the case in all probability comes under the class of twin pregnancies. Certain doubtful circumstances regarding the first infant, coupled with the fact of its early death, seem to point to the conclusion that it was born immature.

Dr. Möbus, of Dieburg, reports a similar case, the narrative of and remarks upon which we take from Taylor's well-known work on Medical Jurisprudence.

"A healthy *married* woman, about thirty-five years of age, was safely delivered of a girl on the 16th of October, 1833. The child is described as having been well-formed, and having borne about it all the signs of maturity. This woman, it is to be observed, had previously had several children in a regular manner. Soon after her delivery, and the expulsion of the placenta, she felt, on this occasion, something still moving within her. On examination, the mouth of the uterus was found completely contracted, and the organ itself so drawn up as to render it difficult to be reached; but the motions of a second child were still plainly distinguishable through the parietes of the distended abdomen. Her delivery was not followed by the appearance of discharge (lochia) or by the secretion of milk. The breasts remained flaccid, and there was no fever. On the 18th of November, *thirty-three* days after her first confinement, this woman, while alone and unassisted, was suddenly delivered of another girl, which, according to Dr. Möbus, was healthy, and bore no sign of *overmaturity* about it. The reporter alleged that this case most unequivocally establishes the doctrine of superfoetation. The two births took place at an interval of thirty-three days, and the two children were, it is stated, when born, equally well-formed and mature; but Dr. Möbus did not see the second child until twenty-

plainly, there is no mechanical, nor, if the function of the ovary be not arrested, is there any physiological *impossibility* that a new ovum might be fertilized, at any period prior to that at which the decidua vera and the decidua reflexa come into contact, and be developed in a special decidual sac. But some of the cases last cited, if they are to be taken as cases of superfœtation, would seem to point to a new impregnation at a period later than that at which the two decidual layers come into contact; a difficulty which is ingeniously got rid of by Dr. Matthews Duncan, who says, "if we suppose, in an instance of this kind, that the first child is born prematurely, but within the limits of viability, we thus gain two months; and if impregnation may take place between two and three months after conception, we have thus four or five months of interval accounted for between the births of successive viable infants."

It is admitted on all hands that superfœtation may take place in cases of extra-uterine pregnancy. This, taken in connection with the facts hitherto ascertained with reference to menstruation during pregnancy, seems to indicate pretty clearly that the function of the ovaries is not necessarily interfered with in the course of gestation; but, at the same time, cases of this nature must be considered as standing by themselves, and not affecting directly the ordinary question of superfœtation. An example of this is reported by Montgomery, in which, while the product of an extra-uterine gestation remained encysted within the abdomen, the woman bore three children, one of whom lived. A similar case has been recorded by Dr. Steigertahl; and another still more interesting by M. Cliét, of Lyons, in which a woman died suddenly, and, upon dissection, an extra-uterine foetus of five months was found in the abdomen, while a foetus of three months occupied the uterus.

In another group of cases, of which many are on record, a second impregnation takes place, and development goes on within the unoccupied cavity of a double uterus. Of these, few present features of greater interest than one which was brought under the notice of the author by Dr. J. Harris Ross, of Brighton. It was embodied by him in his graduation thesis at the university of Glasgow in 1871, and was subsequently published in the *Lancet*. The following is Dr. Ross's report :

"Mrs. C——, the subject of these remarks, is a woman aged thirty-three. She has been married fourteen years; and, previous to the circumstance I am about to relate, had been delivered of six children. With the last three I was the medical attendant; but had never before had the opportunity of examining the uterus, as the child on each occasion was quite at the outlet of the vagina when I arrived at her house. With the exception of once (when she was prematurely delivered of a seven months' child) the labors were all natural, and she always made a good recovery.

"She sent for me in May, 1870, as she had considerable hemorrhage. She told me that she was pregnant, and that she had not menstruated since the previous February. On examination, I found the os uteri very flaccid and partially open, and another opening close to the left of it, which I supposed to be an excavated ulcer, and the cause of the hemorrhage. As she objected to the use of the speculum, I ordered her to keep the recumbent posture, and to use an astringent injection, which I sent her, together with some tonic medicine. In a few days the hemorrhage ceased, and she got about her household duties until July 16th.

"On the morning of that day she sent for me in a great hurry. I found her with

strong labor pains ; and on making an examination, I found a bag of membranes protruding from the uterus, which ruptured during my examination. After this the pains left her. I saw her several times in the course of the day, but the pains did not return until about nine o'clock in the evening, when they were of a very feeble character. On examination at this time I found another bag of membranes protruding, which I ruptured, as I thought it might stimulate the uterus to contract. A head then presented, and, after some time, the pains being very feeble, a fœtus was expelled. On again examining, a leg presented, and after a while I delivered her of a second fœtus, and then of a double placenta—that is, one with two cords. The children were, I should judge, of nearer six than five months' growth. After I had removed the placenta, the patient exclaimed, 'I am sure there is another, Mr. Ross,' meaning another child. As the uterus felt rather bulky, I introduced my hand into the vagina, and my finger into the uterus, to make sure, but found the cavity quite empty. At this time the second opening in the uterus was plainly to be felt. The whole course of this labor was very different from her other ones ; the pains were very feeble and the labor unduly long : this I attributed to her having twins.

"About a week afterwards, the patient again declared that she had another child in the womb ; but I pooh-poohed it, as I had made such a careful examination after delivery, that I felt certain I could not have left one behind. She, however, persisted in her statement. One day I went to see her, and my hand being very cold, I placed it upon her abdomen, when I plainly felt the movements of a child, and upon applying my stethoscope the fœtal heart was quite audible. On examination, per vaginam, the two openings could distinctly be felt, when it at once dawned upon me that I had got a case of double uterus, with both sides impregnated at the same time. On introducing a sound into the apertures, there was no doubt they both opened into a cavity or cavities, but, as she was still pregnant, I did not then push the matter further. When laid flat upon her back the tumor in the abdomen was decidedly more to the right than the left side. As there was now no doubt about her being pregnant, I told her to send for me directly she was in labor.

"She went on well until the morning of October 31st, when she sent for me at 6 A.M. On my arrival, I found the head on the perineum, with the membranes protruding. I ruptured them, and delivered her of a female child of full growth in about a quarter of an hour afterwards. On examining the uterus (after removal of the placenta) I could get my thumb into one opening, and, by a little manipulation, my finger into the other, and could distinctly feel a septum between them. She stated that she had menstruated three times since her miscarriage of twins in July. Both mother and child made a good recovery."

The conclusions, then, with reference to this subject, at which we think we are justified in arriving, are,—1st, That in regard to superfœtation, this is a phenomenon the existence of which we see no reason to doubt ; 2d, That in so far as cases of double uterus and extra-uterine pregnancy are concerned, Superfœtation is established beyond question ; and 3d, That, with respect to other cases (to which alone, perhaps, the term superfœtation should properly be applied), while there is more room for doubt, and while a large number of recorded cases are merely twin pregnancies, a sufficient number of authentic examples are on record to establish a strong presumption that, up to the period when the decidua reflexa comes into contact with the decidua vera, and, probably, until the two have become intimately adherent, there is a possibility of a new impregnation. Beyond this period we believe it to be impossible.

The subject is, however, so veiled in obscurity, that we hesitate to deny the possibility of error, or to admit, unreservedly, the doctrine of superfœtation. At the same time, we must not urge too far mere improbabilities as against rational proof. Much, we admit, must be established in regard to the matter, before the doctrine can be expected

to obtain universal credence; but we apprehend that the confident opinion of those who reject it, in face of ascertained facts, is, to say the least, decidedly premature.

CHAPTER XI.

PLURAL PREGNANCY.—EXTRA-UTERINE PREGNANCY.

PLURAL PREGNANCY—MODE OF IMPREGNATION—TWINS: DISPOSITION OF THE MEMBRANES AND PLACENTA IN: DIAGNOSIS OF: RELATION OF TO SUPERFŒTATION—TRIPLETS, ETC.—EXTRA-UTERINE PREGNANCY—VARIETIES OF: OVARIAN: TUBAL: TUBO-OVARIAN: ABDOMINO-TUBAL: TUBO-UTERINE, ETC.: ABDOMINAL—CAUSES OF EXTRA-UTERINE PREGNANCY—DEVELOPMENT OF THE OVUM AND ITS COVERINGS—SYMPATHY OF THE UTERUS—SYMPTOMS—PROGRESS OF IN DIFFERENT VARIETIES: RUPTURE OF THE SAC: PERITONEAL INFLAMMATION: DISCHARGE OF FŒTAL DÉBRIS—TERMINATIONS—TREATMENT.

THE term Plural Pregnancy may be held to include all cases in which two or more germs are fertilized, simultaneously or nearly so, and are together developed within the uterine cavity. The products of conception in these cases are termed twins, triplets, quadruplets, &c., according to their number. It has been observed that certain women are peculiarly prone to plural conceptions; that those, for example, who have once borne twins are much more likely to carry two children again than those who have not. Whether such pregnancies are or are not the result of separate acts of insemination, is a question in regard to which we cannot venture beyond conjecture. Many facts, such as the birth of twins of different color, have been observed, which seem to show that successive acts within a limited period may be the cause of the impregnation of separate ova. But it is in the highest degree improbable that this is always the case, for there is no reason to believe that, if the semen comes into contact at the same time with two mature ova, one only is to be fecundated, and the other passed over. Indeed, in cases of double yolk, where twin pregnancy occasionally arises, it is apparent that what may suffice to fecundate one germ, can scarcely fail similarly to act upon the other. We shall not pause here to consider whether or not we are to explain the fact of the frequent unequal development in multiple pregnancies by the doctrine of superfecundation, but nothing is so common in this class of cases as to find one child well developed and vigorous, while another is weak and puny.

Twin Pregnancies occur once in about 75 to 80 cases, and triplets certainly not oftener than once in 5000. Cases where the number of children is greater are extremely rare. It was for long doubtful whether two embryos which were being simultaneously developed belonged to the same or different ova, and whether, in the last case, these ova proceeded from the same ovary. Modern research has in reference to these

and normal manner. In very rare cases, the interval between the two births may extend to a period of weeks, or even of months, and there can be little doubt that many of these cases have given rise, on erroneous grounds, to a belief in the theory of superfœtation, the error arising from the fact that the immaturity of the first child is overlooked.

It is unnecessary to make further mention of the other varieties of multiple pregnancy, as the observations which have been made may be held, *mutatis mutandis*, as applicable to these also. To judge from the few cases in which observations have been made, it would appear to be rare that each foetus, the number being more than two, is inclosed in its own complete sac. Several cases of triplets are, for example, recorded, in which one had a special sac, while the other two had a common amnion. In regard to the possible retention of one or more of them, we may well suppose, to judge from analogy, that any conceivable combination of the numbers is in this respect possible. The practical bearing of plural pregnancy on the progress of labor will be noticed hereafter.

Extra-uterine Pregnancy.—Although the cavity of the womb is the site which nature has specially prepared for the development of the fruit of conception, it occasionally happens that it goes through its characteristic phases of development elsewhere. Generally, in these cases, its growth is arrested at a stage considerably short of maturity; but many instances have occurred in which the full period of gestation has been reached, and some in which it has been considerably exceeded, although the cavity of the uterus was entirely empty, as in the virgin state. The ovum is, as has been shown, developed within the ovary in the Graafian vesicle; and what has been observed in the lower animals leads us to conclude that while yet it occupies that situation, and even before the rupture of the vesicle has occurred, impregnation may occur. On the bursting of the vesicle, the germ is received into the infundibulum or pavilion of the Fallopian tube, and is thence conducted slowly through the entire length of the tube, until it reaches the uterine cavity, where its subsequent development progresses until the moment of delivery. Such we know to be the law of nature. Constituting an exception to this law, the ovum may, however, be arrested at any point of its course, and there taking root, as it were, the vital processes of development go on, up to a certain point, as actively and as efficiently as if the ovum had passed on to its usual site. In other cases it may deviate from its normal channel, and, escaping between the fimbriæ of the Fallopian tubes, falls into the cavity of the peritoneum, to some portion of which membrane it attaches itself. These are the circumstances which constitute extra-uterine pregnancy, and cases as they occur are classified more or less elaborately according to the anatomical relations which the ovum assumes in its unwonted situation. The usual division is into Ovarian, Tubal, and Abdominal cases, with many subdivisions, the more important only of which will be noticed.

The existence of Ovarian pregnancy has, by Mayor, Velpeau, and others, been absolutely denied. The denial seems, however, to have been founded on the assumption, which we believe to be unwarranted,

and the placenta in the uterus—the two being connected by a cord which ran from the placenta for some distance within the Fallopian tube, and then perforated it to join the foetus. These latter cases have been called *utero-tubo-abdominal*, and in reference to them, it is in the highest degree probable that they were originally cases of tubal pregnancy, in which the placenta had been developed within the uterus, while the foetus had escaped into the peritoneum by rupture of the walls of the sac in which it had been contained. Another rare form has been described as *sub-peritoneo-pelvic*; in which it is assumed that the ovum, having been unable to enter the external orifice of the tube, has got between the folds of the broad ligament, and there developed itself. It has been justly observed that, if this variety does occur, a more favorable result may be anticipated than in the other forms; because, in such a situation, the débris of a dead foetus may be more easily and more safely removed.

In Abdominal Pregnancy, the fertilized ovum escapes the grasp of the fimbriæ, and falls into the cavity of the peritoneum, to any portion of which membrane it may in fact become attached. We may thus find it firmly incorporated with the ovary, the broad ligament, the intestines, the colon, and any other parts to which continuity of tissue permits its access. The essential physiological difference between an abdominal case and the other varieties of extra-uterine pregnancy is that, in the former, the ovum is without any special covering which can correspond to that which, under other circumstances, it derives from the tube or ovary. It grafts itself, so to speak, upon the peritoneal surface of some viscus, or of the abdominal wall, and if it is subsequently covered with any sac which may be taken as the analogue of the uterus, that must be the result, physiologically, of special evolution, or, pathologically, of inflammatory action.

Little has been hitherto discovered which enables us to come to a satisfactory conclusion, in regard to any of the above varieties, as to the Causes of extra-uterine gestation. Many have believed that a shock or fright, or a blow on the lower part of the belly may, should this chance to coincide with the moment of conception, give rise to it, and they ground this belief on facts which women have from time to time communicated. No single observation affords, however, to this theory, even the shadow of a proof, and the so-called evidence on which it rests, may perhaps be attributed without impropriety to that love of the marvellous which exists in so many minds. We cannot doubt that certain pathological conditions might furnish the cause; and, in some instances, the existence of such pathological conditions has been established. Inflammatory action of any kind, induration, pressure exercised by morbid growths, spasm of the muscular fibres of which the tube is so largely composed, so as to cause stricture, are a few of a hundred such conditions which might be specified as *possible* causes of the phenomenon. The fact is, however, that in most of the cases in which a careful examination has been made, the course of the pregnancy alters so the anatomical conditions of the chosen site, that it is impossible to come to any satisfactory conclusion as to the original condition of the parts. Some very curious phenomena have been observed, showing

that the ovum is sometimes very erratic in its course. How otherwise are we to explain the facts observed in Dr. Oldham's cases, in which there was a distinct *corpus luteum* on one side, and tubal pregnancy on the other, for we must accept, as Dr. Tyler Smith says, in reference to one of these cases, one of three explanations: "The unimpregnated ovule might have been swept by the cilia of the peritoneum from the right ovary to the fimbriated extremity of the left tube; this would be similar to what occurs in the Amphibia, in which the ova always traverse the abdomen to reach the oviduct. Or the left tube may have reached over to the right ovary and have taken up the ovule. According to the third explanation it might be that the ovule had descended the right tube, entered the uterus, and then ascended through part of the left tube by an antiperistaltic action, or by the ciliary currents which move from below upwards." The view which Dr. Smith preferred in regard to the case in question was the third; while Dr. Oldham and Mr. Wharton Jones were inclined to accept rather the second of the explanations offered. It is possible that some cases of extra-uterine pregnancy may owe their origin to some such peculiarities in the evolution of the ovule.

In every form of extra-uterine pregnancy, the ovum forms its own membranes, and goes through the various phases of evolution in all respects as if the pregnancy were normal. It is therefore in every case covered by its own amnion and chorion, without which indeed further development were impossible. For, if we reflect on the manner in which the main circulation of the embryo is established through the agency of the latter membrane, we cannot by any possibility agree with those who have maintained that in abdominal pregnancies there is no chorion. So far all cases are alike. But in regard to the further coverings of the foetus which, external to those just named, are of maternal origin, and correspond to the decidua and the uterus, great differences exist according to the class of extra-uterine pregnancy to which each case is to be referred. It is probable that in tubal pregnancy the mucous membrane may form, as in ordinary cases, a special envelope strictly analogous to the decidua; but, whether we take this view of the case or not, it is clear that, in every instance, the sac within which is contained the foetus and its special structures, is composed of the mucous, muscular, and serous layers of the Fallopian tube, which become distended, and at the same time hypertrophied, as the ovum grows. In true ovarian pregnancy, the sac must consist originally of the walls of the Graafian vesicle, and externally of the tunica albuginea and the peritoneum; and in the compound forms the sac may be partly tubal and partly ovarian, or partly tubal and partly uterine, the covering depending simply in each case upon the site at which the ovum becomes arrested.

Cases of abdominal pregnancy differ materially from all others in this respect, and stand on that account in a class by themselves. The ovum is not in this variety arrested at any point of the canal through which nature intended it to pass; but escapes altogether from that canal and falls naked into the great abdominal cavity, without any special covering whatever, unless it be some remains of the granular

disk in which it was imbedded. Here, in the early stage at least, there can be no special covering, nor connection with the maternal parts other than mere juxtaposition, the result of gravity or some other accidental circumstance. If the ovule has not, prior to this, been fertilized, it will no doubt rapidly disappear, and be absorbed with the secretions of the peritoneal surface. But if, on the other hand, an independent vitality has been communicated to it by conception, it bears the life which it contains to some point accidentally selected, and having there grafted itself upon the subjacent part, the essential contact between the maternal and foetal systems is established, and the subsequent stages of development ensue. There can thus be in the first instance, no sac whatever, and although it is not impossible that a special sac might be developed from the peritoneal surface, as under ordinary circumstances takes place from the mucous membrane of the uterus, no facts have hitherto been observed to show that the ovum in abdominal pregnancy has any sac external to the chorion. But, should rupture of the membranes of the ovum occur, the embryo, which usually escapes into the abdominal cavity along with the liquor amnii, instantly becomes a foreign body; and, by exciting inflammatory action, provokes the formation of coagulable lymph. This forms a sac around the ovum, inclosing it now in a special cavity, and protects the rest of the peritoneal surface from the dangerous effects of extensive inflammation, which would inevitably ensue from the prolonged contact of the foetal remains.

Whatever the site may be, abdominal or otherwise, at which the fertilized ovum takes up its position, the speedy result is a marked increase in the vascularity of the contiguous parts. If, for example, it becomes adherent to the peritoneal surface of any portion of the bowel, the bloodvessels of that part will at once become the seat of a marked and wonderful hypertrophy. What were before minute twigs now become large venous trunks, and the arterial supply is of course proportionally augmented. The vessels being projected from the embryo to the chorion by means of the allantois, the vascularity of that membrane is at once established. Those of its villi which belong to the visceral surface undergo marked development, and contract still closer adhesions with the peritoneum. The whole of the tissues become at this point enormously developed, and thus the Placenta is formed, within which the interchange of gases and materials goes on smoothly and, for a time, safely.

During the development of an extra-uterine foetus, certain changes more or less marked have been noticed to take place in the uterus at an early period of the pregnancy. These changes, in so far as they have hitherto been observed, seem to be identical with the preparatory process of which the uterus is the seat at the time of impregnation, and prior to the descent of the ovum. They consist in a marked increase in the size of the organ, in an equally marked increase in its vascularity, and in the characteristic thickening and hypertrophy of the mucous membrane, which is the first stage in the formation of the decidua. These symptoms are, however, of brief duration. The uterus, not receiving the expected stimulus which would have been afforded

by the ovum on its arrival, falls into a state of quiescence, its bulk and circulation being speedily restored, or nearly restored, to the normal standard.

The Symptoms of extra-uterine pregnancy are far from being definite and distinct. Just at first, the changes which have been mentioned as occurring in the uterus would, no doubt, tend to suggest the idea of an ordinary pregnancy. The woman may, at this time, enjoy perfect health, disturbed only by some of the sympathetic digestive disorders which are so familiar. No reliance can be placed on the cessation of the menses as a sign, as, from the narrative of recorded cases, it would appear that the discharge ceases in about the same proportion of cases as it persists. Very generally, from an early period of the pregnancy, abdominal pain is complained of. This may take the form of an intermitting pain; but it is generally constant, and confined to a certain limited region, which may be any one point on the abdominal surface. As the case advances and the ovum grows, considerable discomfort may be caused by pressure, exercised by the tumor directly or indirectly on neighboring organs; causing, for example, if the tumor should encroach upon the pelvic cavity, difficulty in defecation and micturition. Morning sickness, and the various changes which have their seat in the breasts, are of constant occurrence; and, as the case goes on, a tumor may be felt which resembles, more or less closely, the gravid uterus, but which is frequently more irregular in outline, and situated more to one side than in the middle line. At the proper time, quickening takes place, and is soon succeeded by the pulsation of the foetal heart. Should suspicion have arisen as to the nature of the case, it is probable that the absence at this time of the characteristics which are revealed in ordinary pregnancy by a vaginal examination might throw considerable light on the case. If the pregnancy goes on without accident or hindrance till the period which marks the ordinary limit of gestation, pains come on, which are periodic, and which are described by women who have already borne children as precisely similar to ordinary labor pains. "These pains," says Burns, "usually begin in the sac, and then the uterus is excited to contract and discharge any fluid it contains." This uterine effort, at the end of the ninth month, is a physiological fact of surpassing interest, and seems to us to afford strong corroborative evidence of the correctness of that theory which supposes that the cause of labor has its seat neither in the foetus nor in the uterus, but is, probably, to be found in the ovary, and is generally to be looked for at the tenth menstrual period after impregnation. In weighing the symptoms in a doubtful case, a fact which has already been mentioned in reference to the question of superfetation should be borne in mind, viz., that a second (uterine) pregnancy is quite possible; and, indeed, a most striking case is quoted by Montgomery from Primrose, in which a woman went to the ninth month of her seventh gestation, when labor came on as on former occasions, although, ultimately, it turned out that there was a prior abdominal pregnancy.

The cases, however, in which extra-uterine pregnancy is prolonged till the ninth, or even the eighth month, form a very small proportion of the whole. It is, in point of fact, an unusual occurrence when

development in such a case continues beyond the fourth or fifth month; but on the other hand, cases are on record, which are apparently authentic, in which the life of the foetus was prolonged within the abdomen for several months beyond the ordinary period. M. Deseimieris, whose memoir on this subject is justly considered as of great value, states that rupture occurs in more than three-fourths of all cases; that, in the tubo-uterine variety, it takes place, as a rule, before the end of the second month; in tubal, in the fourth month; later in ovarian pregnancy; and, in abdominal pregnancy, not till the eighth or ninth month. The usual crisis, then, in all such cases, which may arrive sooner or later in their course, is rupture of the sac and of the foetal membranes, or of the latter alone in abdominal pregnancies.

The symptoms which follow rupture of the sac are of extreme gravity, and the result invariably is that the life of the woman is placed in extreme jeopardy. The rupture is frequently preceded by severe pains, which may continue for several hours. A sudden cessation of these pains is then observed to coincide with a notable diminution in the size of the tumor. This is succeeded almost immediately by pallor, dimness of vision, vomiting, syncope, and other symptoms which indicate severe internal hemorrhage. To these succeed loss of pulse, clammy sweat, convulsions, and death—or, the bleeding being arrested, the patient rallies and escapes the immediate danger of hemorrhage.

If, after rupture of the sac, the hemorrhage is limited in extent, or if something occurs to check it by favoring the coagulation of the blood, the death may not be immediate. Death may, nevertheless, take place, as the result purely of hemorrhage, after an interval of some days; whereas, if the flow of blood be effectually barred, the patient may rally, and the symptoms of impending dissolution may disappear. But the danger which has thus been averted is forthwith succeeded by another equally grave. The foetus, the amniotic fluid, and the blood which has been effused arouse the most violent peritoneal inflammation, which rapidly runs its course, generally with a fatal result. Should the powers of nature be of sufficient energy to overcome this second assault, the effect of the inflammatory action is rather beneficial than otherwise, for the foetus now becomes inclosed in a sac which is formed from coagulable lymph, the product of the inflammatory action, and which effectually shuts it out from the rest of the abdominal cavity. Within the new cavity, a process of disintegration or modified decomposition goes on in the greater number of cases. The presence of the foetal debris excites anew inflammatory action, which probably extends to contiguous viscera, between which and the sac adhesions may be established. To this succeeds ulcerative absorption, which may result in the establishment of fistulous openings in the direction of the hollow viscera, or externally through the abdominal walls: or perforation may take place a second time into the peritoneal cavity, with little hope of any result other than a fatal one. But if the perforation take the direction first mentioned, we may have, for weeks or months, portions of the more indestructible foetal structures, bones, teeth, and the like, discharged through the abdominal wall, the vagina, the rectum, the bladder, or even the stomach; and, if there be more than one fistulous

opening, we may have portions successively or simultaneously discharged through two or more of the channels which have been enumerated. While the discharge of débris is going on, the inflammatory action in the interior of the cyst continues, and is probably aggravated by the admission either of the external air, or of the contents of the hollow viscera into which the opening takes place. Irritative fever of a severe type is thus often set up, and to this, those women who have been so fortunate as to escape the dangers already specified may succumb.

In some instances, the course and termination of extra-uterine pregnancy is very different to what has been detailed. The pressure of the tumor may be productive of such annoyance and pain, or may interfere so seriously with the functions of neighboring organs, that the woman sinks and dies without any rupture having occurred; or even, in so far as can be ascertained, without the death of the foetus having preceded that of the mother. Or, as in another class of recorded cases, the child may die before rupture of the membranes has occurred, a result which we must look upon as favorable in the progress of these cases. For the first result of this is the arrestment of placental circulation, the dwindling of the enlarged vessels on the mother's side, and the consequent abatement in the risk from hemorrhage to which the woman is subjected. Under such exceptional circumstances, it is quite possible that no rupture of the original sac may occur. The foetus will then be retained without the occurrence either of hemorrhage or peritoneal inflammation, but ultimately its remains will most likely be extruded by a similar process, and through the same channels as in the cases above mentioned. In some remarkable instances, the irritation caused by the presence of a dead foetus has been so inconsiderable as to permit of its residence for many years within the abdominal cavity, without causing any alarming symptom. It is probably in such cases that the putrefactive process undergoes the peculiar modifications which are manifested either by a withering or mummification of the foetus, or by a change which seems to be closely allied to *adipocere*. In many of the recorded cases in which the foetus has been retained for an unusually long period, the sac would appear to have become the seat of calcareous deposit, which, by thickening and strengthening its walls, may be supposed at once to protect the foetus from external violence,—which might induce inflammatory action,—and, at the same time, to protect the external parts, by rendering its rupture practically all but impossible. Burns mentions a case in which he had known the foetus retained for twenty years, and there have been instances in which it has been retained for thirty, forty, or fifty years. Women, in some of these cases, have repeatedly become pregnant, and have been delivered of healthy children at the full time without disturbing the retained ovum.

In regard to the Treatment of extra-uterine pregnancy, much must in every case depend on the stage of development and the other circumstances of the case. In so far as the early weeks are concerned, it must be obvious that, accurate diagnosis being impossible, treatment can only be palliative, or directed against symptoms, the import of which we can only guess at. But even to suppose an exceptional case in

which all diagnostic difficulties were removed, and the existence of an extra-uterine pregnancy revealed to us in a manner which excluded the possibility of doubt, our attempts at treatment would be confined within very narrow limits, and would consist of the most simple possible measures. If the sac were lodged in the pelvis, interference would very probably take place with the functions of the bladder and rectum, requiring close attention to the state of the bowels, and perhaps frequent mechanical aid for the relief of the bladder. The attacks of pain, which are of such frequent occurrence in all the forms, will be most certainly and satisfactorily removed by anodyne applications, and by opiate suppositories or enemata, strict rest in the recumbent posture being at the same time enjoined, with careful attention to the digestive and other functions. It has been suggested by Cazeaux that, even at this early period, attempts should be made, by bleeding to syncope, or by electric shocks passed through the abdomen, to destroy the life of the foetus. Were this practicable, it would be sound treatment, in view of the probabilities of the case, to cut short the existence of the foetus; but we apprehend that the result looked for could not be counted upon, while the treatment adopted might otherwise be productive of disastrous results. It has also been recommended to perforate the sac by trocar from the vagina, should this be practicable—a step to which Scanzoni lends his powerful advocacy.

When the period of expulsive effort arrives, it comes to be a question whether in any case we may interfere with a view to the relief of the patient by immediate delivery. The cases, doubtless, in which operative interference may be resorted to, with the greatest prospect of success, are those in which the foetus is felt through the vagina, and the nature of the case is distinctly made out; and an additional argument in favor of operation will doubtless be afforded by proof of the life of the child. Besides, there is always the chance that the case may be one of those which have been described as *subperitoneo pelvic*. The operation, if resolved upon, consists in an incision through the vaginal walls, and the removal, by forceps or otherwise, of the foetus; and, if practicable, of the placenta and other parts. By having recourse to this procedure, the lives of infants have been, in a considerable number of instances, preserved; but, as a general rule, the mother has succumbed.

If the pregnancy has reached the eighth month, and the life of the foetus is indicated by the usual signs; and if the sac can be reached only through the abdominal walls, it is, of course, possible to anticipate rupture, and to extract, by gastrotomy and incision of the sac, a living foetus. To this operation the name of Laparotomy has been given, and to its performance few obstacles or difficulties would seem to arise. But if we balance the chance of the child's life against what is almost the certainty of the mother's death—which, even under the most favorable conditions, must be the state of the case—we are constrained to pronounce, under such circumstances, emphatically against the operation. The great and special danger which attends its performance is the removal of the placenta, attached, as it probably is, to an undulating and irregular surface. This interposes, in the first place, considerable mechanical difficulty in the removal of the organ; and, in the

second, makes it certain that, if we do remove it, we shall have fearful hemorrhage from the gaping vessels, for the closure of which there is no provision analogous to the disposition of the muscular fibres of the gravid uterus. It is otherwise, however, in cases where a living mature child has escaped, by rupture of the sac, into the abdominal cavity, for here the analogy is complete between the case in question and one in which a living child has similarly escaped through a uterine rupture; for, by the operation in these circumstances, the risk to the mother will be little aggravated, while the life of the child may almost certainly be saved.

In the case of a woman who has carried, for one or more years, an extra-uterine foetus, which causes her great suffering, or which is obviously undermining her general health, the question of operation may also suggest itself, although in a different form. The rule which must here guide us is, in addition to the state of her health, the possibility of reaching the tumor from the vagina; for, unless we were convinced of the existence of adhesions to the anterior or lateral abdominal walls, an operation in this direction would, we conceive, under no circumstances be warranted.

The duty of the surgeon will, however, in most cases, be confined to carefully watching and cautiously assisting in the separation of the foetal debris. Should one or more fistulous openings exist in the abdominal walls, the vagina, the perineum, or the rectum, the nature and extent of the cavity of the sac may be carefully explored through them. By the aid of sponge-tents, the apertures may be safely distended, and any loose portion removed; care being always taken not to drag rudely such fragments as may be adherent to the walls of the sac, as by doing so the sac might be ruptured, and peritonitis ensue. If the communication has taken place in the direction of the bladder, it may be necessary to remove them by one of the operations for lithotomy; or by dilatation of the urethra, as was done by Professor G. H. B. McLeod in a case which he communicated, many years ago, to the Medico-Chirurgical Society of Glasgow. While the separation of the remains of the foetus is thus promoted, in any way which experience may suggest to us as consistent with safety, the general health of the woman must be carefully attended to, her strength being sustained by nourishing food and suitable stimulants, while any tendency to hectic or irritative fever must receive its appropriate treatment.

CHAPTER XII.

ABNORMAL DEVELOPMENT.

MOLAR PREGNANCY—FALSE MOLES: FROM VAGINA: MEMBRANOUS DYSMENORRHOEA: FIBROUS AND HEMORRHAGIC CASTS OF UTERUS—TRUE MOLES: FLESHY MOLES: HYDATIDIFORM MOLES—THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT—DISEASES OF THE PLACENTA, AND THEIR EFFECTS—MISSED LABOR—DISEASES OF THE FŒTUS—INTRA-UTERINE FRACTURES AND AMPUTATIONS: EFFORTS AT REPRODUCTION—MONSTERS.

THERE are, in addition to the peculiarities of development already noticed, certain others which deserve special notice in a systematic treatise, but which, nevertheless, are not unfrequently passed over as of no moment. There is every reason to suppose that these peculiarities have their origin, in a large proportion of instances, in actual disease of the ovum; but whether this is or is not the primary cause of the affection in question, no doubt can, in the present state of pathological knowledge, be admitted as to the frequent coincidence of disease or degeneration of the ovum, either with arrest of development or with the transference of developmental energy to structures which are merely subsidiary. The result of this is the occasional expulsion from the uterus of substances, the nature of which it is not always easy to determine, and the origin and pathology of which have often been misunderstood. These substances are generally termed Moles.

It must be made clear, however, from the outset, that all solid matters discharged from the uterus are not moles, properly so called. In other words, all such discharges are not the result of impregnation—a fact which is of obvious medico-legal importance, and which imposes upon us the necessity of drawing a careful distinction between "*true*" and "*false*" moles. The matters which are discharged from the virgin, or which are independent of impregnation, and which might be mistaken for the result of conception, form but few varieties, and constitute what are termed, with questionable propriety, False Moles. Under this designation may be included bodies, which are composed mainly of the squamous epithelium of the vagina, thrown off in the form of flakes, or tubular casts; and, which may either be expelled singly, or form, by their union, masses of greater or less bulk, but seldom of any considerable size. A careful examination of these by the microscope, or even by the eye, will generally obviate the possibility of error; but, as regards the following, the unwary may easily be misled. It is a fact familiar to every physician, that the most obstinate and intractable form of painful menstruation, or Dysmenorrhœa, is the membranous variety, in which the mucous membrane of the uterus is shed at each catamenial period, either in shreds of various size, or in the form of a single mass,

forming a complete cast of the uterine cavity. In some rare instances this occurs also independently of menstrual disorder. It may readily be conceived that in such a case, accompanied, as it generally is, with hemorrhage and sustained expulsive effort, a suspicion of pregnancy and early abortion might arise in the mind—the membrane in question being mistaken for the decidua, from which the embryo has escaped unobserved. In such a case, however, the true nature of the substance discharged may be disclosed by remembering that such an occurrence is not unusual at a menstrual period, and by observing that all the usual and familiar signs of pregnancy are absent. It is, moreover, much less substantial in its texture, and more easily torn than the decidua, which has, under such circumstances, according to Montgomery, “a soft, rich, pulpy appearance, deep vascular color, and numerous well-developed utricular follicles or crypts, and foramina for the reception of the nutrient vessels from the uterus, which are always so distinctly observable. In one point, however, the dysmenorrhœal membrane resembles the decidua—having its inner surface smooth and the outer unequal; but it is of a ragged, shreddy appearance, unlike that of the healthy uterine decidua, and is, moreover, entirely destitute of the little cotyledonous sacculi described as an essential character in the latter structure.” No trace of anything analogous to the transparent membranes of the ovum is to be discerned within it, nor does it contain a reflected layer, forming an inner pouch. When perfect it presents three openings—one for each Fallopian tube, and one at the points of connection with the cervix uteri.

A third variety of false mole has been described as occurring under certain conditions of functional derangement of the uterus, more especially when this is accompanied with some form of inflammatory action. In it, the substances expelled are of a fibrinous appearance externally, of a firm consistence, and varying greatly in size, but frequently presenting the form of a cast of the uterine cavity. Most frequently these are composed of blood-clots, which have become condensed and altered in appearance by their decolorization externally. In certain cases, they appear to be composed partly of clot and partly of lymph; while in others, which have been carefully observed, it would appear that a membranous cast has been surrounded by an outer layer of condensed coagulation.¹

The True Moles differ from the above essentially in this, that they are in every instance the result of conception, in which, generally, the embryo has been blighted, and yet development of the membranes has progressed with abnormal activity. In the investigation of these cases, it is of importance to remember what Smellie tells us. “Should the embryo die,” he says, “(suppose in the first or second month), some days before the ovum is discharged, it will sometimes be entirely dissolved, so that when the secundines are delivered there is nothing more to be seen. In the first month, the embryo is so small and tender that the

¹ These formations are fully described and graphically depicted by Dr. A. B. Granville, in his admirable monograph on Abortion and the Diseases of Menstruation.

dissolution will be performed in twelve hours; in the second month, two, three, or four days will suffice for this purpose." If this is the case when the ovum is expelled shortly after the death of the embryo, it need not astonish us that when it is retained for a considerable period all trace of embryo has disappeared, while the membranes are so degenerated or metamorphosed that it is only with difficulty that the true nature of the case can be recognized.

Of the highest interest and importance in reference to this subject, and more especially to the question of etiology, are the hemorrhagic discharges of which the ovum is the seat. In addition to the direct effect, which must spring from the sudden abstraction of blood either from the foetal or maternal vessels connected with the ovum, the blood which flows from the ruptured vessels very frequently exercises a mechanical influence in the separation of contiguous parts, with the most disastrous results. Blood may thus be interposed by the rupture of the utero-decidual vessels, and so cut off the only maternal supply possible for the early embryo. Or, at a later stage, hemorrhage from the utero-placental vessels may so engorge the parenchyma of the placenta, as to cause apoplexy of that organ, an affection which we shall have occasion hereafter to mention. Again, the extravasation may take place between the chorion and the decidua reflexa, or even within the amnion, destroying the embryo and giving rise to abortion. Particular attention has been given by Scanzoni to the various forms of apoplexy of the ovum, a subject which is of interest to us at this stage, as a cause not only of death of the embryo, and of abortion, but also of the formation of true moles, when abortion does not at once ensue. His conclusions as to the progress and termination of the hemorrhage are as follows :

"1. If the flow of blood is simply from the utero-placental or utero-decidual vessels, and the quantity is inconsiderable, this does not suffice to separate the ovum in the greater part of its circumference, or by mechanical pressure to arrest its further development; so that blood effused between the uterine walls and the decidua, or even between the two layers of the latter, may be either completely or, at least, partially reabsorbed, and the pregnancy may reach its normal termination.

"2. But if the quantity of the effused blood is considerable, the ovum is separated from the uterine walls either entirely or to a great extent, and is compressed by the voluminous coagulum, and more or less flattened: such compression actually causes bursting of the membranes (of which Dubois narrates a case), when abortion is the usual result.

"3. The same is the result when the foetus dies through rupture of its own vessels and the placental hemorrhage thus induced. Here also the abortive ovum is expelled, the rapidity with which the abortion occurs depending especially on the occurrence of simultaneous uterine hemorrhage.

"4. The ovum may, as is much more rarely the case, remain with the dead foetus for a considerable time in the uterine cavity; the coagulum undergoes certain changes, which are also observable in extravasation in other parts of the body, and so gives occasion for the origin of the formation known under the name of *Fleshmole*."

The *Fleshy Mole* (*Mola Carnosa*) is probably formed in part from coagula and in part from the membranes of the ovum, which undergo a species of degeneration by some such series of changes as the following: The effused blood becomes in the first instance decolorized by rupture of the blood-corpuscles and absorption of their coloring matter. This decoloration takes place from the centre towards the circumference. The fibrin, as Scanzoni supposes, becomes transformed into cellular tissue, by means of which communication is established between the external lining of the ovum on the one hand, and the inner surface of the uterine wall on the other,—so that the further development of the structures thus in apposition is rendered possible. We may assume that in these cases complete separation of the ovum cannot have taken place, otherwise the death of the whole structures of the ovum would have rendered its expulsion inevitable. And, as the connection between the uterus and the ovum is most firm at that part where the placenta has either formed or is about to form, the probability is that the vascular supply sent to the ovum through this channel is never entirely cut off. On the establishment of new and more extensive adhesions, the blood supply is at once augmented, and the membranes and effused coagula become intimately bound together into a mass, through which vessels freely run, and which becomes hypertrophied to a very considerable extent. It would appear that, at least under certain circumstances, the chief seat of the carneous degeneration is the decidua vera; for, it is certain that in many of the cases which have been most carefully examined, the structure of the chorion has been distinctly recognized by its villi, although the membrane itself had undergone some considerable thickening. The villi in these cases have been found to consist of molecular masses and fat-cells. The amnion undergoes little change, and may be found adhering to the inner surface of the chorion, and containing within its cavity a certain quantity of bloody fluid, in which will be found what remains of the embryo. The rudiments of the embryo are, however, frequently very indistinct, unless the pregnancy should chance to have been more advanced than usual; and, indeed, difficulty will frequently be experienced in tracing even the remains of the cord, although the chorion and amnion may be tolerably distinct. The nature of the case will nevertheless usually be recognized on a careful examination, by the discovery of the villi of the chorion; and Scanzoni asserts further that in the cases examined by him he has never failed to discover the enlarged villi by the agency of which the placenta was already going through the earliest stage of its formation. While in all these cases the diseased membranes go on increasing in bulk, they are of course rendered quite unfit for the discharge of their primary functions, so that the contained embryo, if its death has not preceded the degeneration, must speedily succumb. “When the growth of the ovum,” says Rigby, “proceeds after the destruction of the embryo, it increases very rapidly in size, much more so than would be the case in natural pregnancy, so that the uterus, when filled with a mole of this sort, is as large at the third month as it would be in pregnancy at the fifth.” As the development of the mole goes on, it increases in density as well as bulk, and the growth may continue for

Although the exact mode in which the vesicles constituting the hydatidiform mole are formed is not yet clearly fixed to the satisfaction of all, there is one point in which all modern authorities are agreed, viz., that they spring from the villi of the chorion. It is also admitted that in this, as in the fleshy mole, we have no new formation, but simply an alteration and degeneration of previously existing structures. But when we come to consider the pathological process by which this alteration is effected, we find that considerable differences of opinion exist. The views on this subject originally propounded by Mettenheimer in 1850, in "Müller's Archiv," and which have been indorsed in this country by Paget and Barnes, are those which are generally entertained. The villi of the chorion, as has been pointed out by modern physiologists, grow normally by a process of gemination, bud springing from bud in successive stages of growth. Under the influence of perverted development, these buds, or the elementary cells of which each villus is composed, take on a new action, and become transformed into vesicles, which vary in size, and to which attaches the power of repeating the process of chorion development, still in a perverted sense, until the so-called hydatidiform mass is formed. Gierse is of opinion that the change consists in hypertrophy of the normal structures found in the chorion villi, with secondary cedema; and Dr. Graily Hewitt urges that the vesicular transformation is a consequence and not a cause of the death of the embryo, and that it is therefore nothing more than a degeneration of structures arrested in their development. We fail to see, however, that the death of the embryo, prior to the formation of the cysts, is in any way incompatible with the theory of Mettenheimer; indeed, we cannot but think it extremely probable that in this, as in the case of fleshy moles, it is the developmental force diverted by the death of the embryo into an unwonted channel which is the great cause of the activity of the degenerative process. And, moreover, this is all the more likely to take the form of cystic degeneration on account of the peculiar anatomical conditions under which the villi of the chorion, and more especially those of the placenta, are produced. The period within which hydatidiform degeneration may originate does not probably extend beyond the tenth week, for it is during that period that the activity is greatest in the growth and multiplication of the villi; and, at a later stage, when bloodvessels have largely occupied the bulk of the villi, it would appear that they are no longer capable of undergoing that form of degeneration. A certain dropsical condition, or secondary cedema, as Gierse describes it, of the membranes, is probably an essential part of the degeneration in question, and may serve to account for the constant supply of the fluid which fills the sacs. Although the special activity in the development of the villi which ultimately would have formed the perfect placenta, might naturally be expected to attract thither the morbid action, experience has shown that this is not invariably the case.

An important question has arisen as to whether a portion of placenta, retained at the full term, can take on hydatidiform change. This has been answered in the affirmative; among others, by Montgomery and Ramsbotham. All recent writers, however, dispute this conclusion.

In the majority of cases, an examination conducted with every care shortly after expulsion fails to detect any trace whatever of the embryo. In some instances, however, a foetus has been discovered. The reason of this lies very obviously in the fact that, here, growth is limited to the chorion and the degenerated villi, and that the uterus is filled with an enormous mass of cysts which have sprung from this source, so that the cavity of the amnion and its contents are almost inevitably obliterated. The destruction of the embryo is, for this reason, much more complete than in the fleshy variety of mole.

In regard to the symptoms of this form of mole, they are at first identical with the ordinary signs which are supposed, in the first three months, to indicate pregnancy. The usual symptoms, and more especially those which have their seat in the mamma, then become indistinct and perplexing. The patient is ill at ease, her appetite and digestion become impaired, and her feelings are quite different to those which attended former pregnancies. So soon as the degenerative process has been thoroughly established, the increase in the bulk of the uterus goes on with very unusual rapidity, and it has been noticed to expand irregularly, and more in a lateral than in the usual upward direction. When the period arrives at which the conclusive proofs of pregnancy should, under ordinary circumstances, be distinctly manifested, the absence of foetal pulsation and ballottement will arouse suspicion as to the nature of the case. But, at a period even earlier than this, watery and sanguineous discharges, mixed or separately, may occur, the former being due to the bursting of distended vesicles, which are doubtless submitted to considerable pressure. It occasionally happens that, along with these discharges, a few vesicles only, or a larger proportion of the mass, escape, which at once reveals the nature of the case. There is, in addition, another symptom to which we would call special attention, and which we have found of the highest importance in practice in the diagnosis of this affection. This consists in a peculiar doughy, boggy feeling, which is revealed on palpation, and which we take to be in the highest degree characteristic, more especially if we take along with it the absence of that irregular hardness which indicates the prominences of the foetus. The term "dense" which we find generally used to describe the feeling of the uterus in this condition, is, we apprehend, singularly inappropriate. "Tense," again, would represent correctly enough the effect of the rapid distension, but the sensation yielded by palpation, which we have had the opportunity of thoroughly testing in several cases, is, we are persuaded, more correctly described above, than by either of the terms specified.

The existence of moles of this nature is seldom prolonged beyond the sixth month, when repeated hemorrhage, and overdistension of the uterus, entailing probably a partial separation of the placenta, will usually have excited uterine contraction. The usual effect of these contractions, when once thoroughly aroused, is to effect the complete separation of the entire ovum, which insures the safety of the woman by the arrest of the hemorrhage. It would seem, however, that under certain special circumstances, fortunately of rare occurrence, the connection between the uterus and the ovum is so firm that a portion

only of the fruit of conception is expelled. "In such cases," says Scanzoni, "portions of the ovum remain behind in the uterine cavity for a considerable time, on account of their firmer connection with the inner wall of the uterus. These may give rise to profuse and long-continued floodings, as we have seen in one of our cases occurring in the gynæcological clinic at Prague, where an exhausting hemorrhage, which had continued for some months after the expulsion of a vesicular mole, was first arrested on the removal by the hand of the remainder of the ovum, which had remained behind in the cavity of the uterus."

What is, however, of more frequent occurrence when the whole of the ovum is not at once expelled, is, that the case turns out to be one of twin pregnancy, in which the membranes of one embryo only have become the seat of the degeneration in question. Doubtless, under such circumstances, the uterus, after expelling a large hydatidiform mass, will not cease in its efforts until the whole of its contents have been expelled; but a certain number of cases have been recorded, in which, after such an event, a fully developed child has been expelled after an interval of a few months, a fact which is only reconcilable with the idea above expressed. This is said by Montgomery to have occurred at the birth of the celebrated anatomist Beclard. The most recent observations on this subject seem to indicate that examples of this nature are by no means of unfrequent occurrence, which obviously shows that we should exercise caution in the treatment of such cases, lest we destroy the living germ while removing the dead.

The treatment of all such cases will of course depend on the urgency of the symptoms. So long as they are moderate in severity, and are not such as to call for immediate action, our course of treatment must be purely expectant, more especially as there will almost always be an element of doubt in the diagnosis. But, so soon as profuse watery and hemorrhagic discharges shall have reduced the strength of the woman to a certain extent,—of which we must judge on general principles,—we must not delay until interference is a mere *dernier ressort*, but act promptly, and in the manner most likely to empty the uterus speedily of its contents. In several cases of hydatids, we have found the ergot of rye act quite satisfactorily, and effect expulsion without difficulty; as indeed, it usually does when the uterus has reached a certain degree of distension. We recommend, therefore, that in the first instance, this drug should be employed, but if, as often happens, it fails to excite uterine effect, we must then resort to other means. A sound or catheter has been introduced into the womb, and successfully used so as to break up the mass, and separate it as far as possible from its uterine attachment; but we should think it a safer as well as a more satisfactory method, to dilate the os and cervix by means of Barnes's bags or other similar appliances, so as to introduce the hand, and remove at once the whole mass. The dilatation of the os and cervix by means of sponge-tents would also have the effect of exciting the uterus to contraction, and would have the further advantage of checking hemorrhage. Galvanism has also been recommended, the object, of course, in each and all of these modes of procedure, being to empty the uterus safely as well as quickly. Nothing special need be

said in reference to the treatment of the fleshy mole, as in that case the diagnosis is much more difficult. Although the unexpected arrest of development, and the general constitutional disturbance, with the cessation of such of the signs of pregnancy as may previously have been present, may indicate the probability of this affection, it is seldom that its nature is recognized until the carneous mass, with the blighted ovum, has been expelled.

There is yet another group of cases in which the pathological phenomena are also to be found in a portion of the ovum, but which occur at a later period of pregnancy than those which we have just been considering. In these instances, development goes on uninterruptedly until the placenta has been fully formed; and it is to diseases of that organ that the death of the foetus is then due. Among the affections of the placenta which may have this result, is Apoplexy of the Placenta, in which blood is effused, by rupture of vessels, into the parenchyma of the organ, exactly as takes place in the lung, and with a similar result as regards the respiratory function. Another affection which, as we have already seen, is apt to attack the tissue of the fleshy mole, is Fatty Degeneration. Recent researches show that, at a more advanced period of gestation, the same pathological change is apt to invade the tissue of the placenta, and so to alter its structure as to interfere seriously with, and ultimately to arrest, the development of the embryo. The cause of this fatty degeneration has been very carefully investigated by Barnes, Priestley, and others; and the conclusion at which they seem to have arrived is, that the fatty molecules are the result of a low form of placentitis,—being either thrown out, primarily, as inflammatory exudations, or formed, secondarily, of inflammatory products, which subsequently degenerate into fat particles. Placentitis is another affection which may cause intra-uterine death,—the inflammatory process, in these instances, attacking the organ, and in extreme cases leading to hepatization, induration, abscess, and the other terminations of the inflammatory state. The morbid action is generally confined to a limited portion of the organ, or to a few lobules, and extends from the maternal towards the foetal surface of the placenta. There is reason to believe that morbid adhesion of the placenta may have its origin in this; and, in connection with it, hypertrophy of the decidua serotina has not unfrequently been observed. General œdema, or dropsy of the placenta, is another affection of the organ which has been carefully observed by Meckel and Gierse. The appearances are here altered to those which are characteristic of œdema in all soft tissues; swellings, paleness in color, and serous infiltration, being the leading features which an examination of the tissue reveals. “This must not,” as Simpson well remarks, “be confounded with the white, blanched, and merely anæmic state of the placenta, often observable in cases where the child has died of peritonitis, or other foetal diseases, and been retained in utero for some time subsequently; and it is pathologically very different also from the stearoid or fatty degeneration.” Hypertrophy of the placenta, cartilaginous and calcareous degeneration, ramollissement, and atrophy, are all affections which have been specially observed. In many of the affections above enumerated, there seems to be a tendency to return in

results of inflammatory action in this situation, the most familiar is chronic hydrocephalus, in which the quantity of serum effused within the cranium is often so great as not only to cause a certain amount of atrophy of the encephalon, but also an increase in the size of the head, so considerable as to form a serious obstacle to delivery. Convulsions may attack the foetus while it is yet in the womb, and cases have been observed in which convulsions on the part of the mother were communicated to the child. The probable cause of these, in most instances, is arrest of the circulation, which causes the foetus to die of apnoea,—of which convulsive action is a frequent symptom. Although the lungs are as yet of very small size, it would appear that they are occasionally, though very rarely, the seat of inflammation; but pleurisy and tuberculosis are of much more frequent occurrence than pneumonia. Acute and chronic peritonitis, whether general or partial in extent, is met with much oftener than the above. This affection may be accompanied with effusions, which are identical in appearance and general characteristics with those which are so frequently observed after birth; and, according to the type of the inflammatory action, they may take the form, either of coagulable lymph, by means of which the viscera may be glued together, or of a fluid effusion, the quantity of which may become enormous, and may cause the death of the foetus either before or after birth, or may even render delivery difficult. It would appear from certain researches made by Simpson in reference to this affection, that it is not infrequently associated with syphilitic disease of the mother. Diseases of the liver and of the spleen, many of them associated with the same constitutional disorder, have also been frequently observed; and, more rarely, affections of the alimentary canal, with which may be classed cases of *Ascarides* and *Tænia*, these entozoa having been repeatedly found in the intestines of the unborn. Congestion, cystic degeneration, and other affections of the kidney, as well as various affections of the ureter have occasionally been noticed; and the same may be said with reference to cardiac diseases, examples of which, including peri- and endocarditis, have also been noted. Various diseases of the skin are observed in children born either prematurely or at the full time, including the characteristic eruption of certain febrile diseases, such as variola, which may be contracted from the mother within the uterus; or, what is much more wonderful, which may be communicated through the mother to the child, she herself remaining unaffected. Erythema, pemphigus, and other forms of skin disease, are very frequently to be received as evidence of the existence of syphilitic disease, in one parent or in both.

Fracture of the bones of the foetus is an affection which is usually the result of violence from without; but a sufficient number of cases have been observed to establish the fact that, independently of any such accident, intra-uterine fracture may occur. Some of the recorded instances of this are of the most extraordinary nature. Chaussier, for example, tells us of one case in which there were forty-three, and another in which there were no fewer than one hundred and thirteen fractures of the bones of the foetus, facts which it is difficult to conceive, unless under the supposition that extensive disease of the bones existed. But

a more extraordinary phenomenon still is the occurrence within the womb of what has been described as spontaneous amputation. Haller, and many physiologists after him, supposed that these were cases of simple arrested development, but that this cannot be the case in every instance is proved by the discovery within the uterus of the missing part. The fact of this spontaneous amputation having, at a more advanced period, been clearly established by irrefragable evidence, the question which next presented itself for solution was the manner in which such a separation within the uterus could by any possibility take place. To this, the reply given by Chaussier, Billard, and other writers of that period, was that the only manner in which it could be accounted for was to suppose that the parts separated had been the seat of gangrene, and that spontaneous amputation had taken place at the line of demarcation between the living and dead tissue. The discovery in several cases of the amputated part, which had not undergone any decomposition, soon proved that this theory was quite erroneous, and it is to Montgomery that we owe what is now generally believed to be the correct explanation of what was long a pathological problem. Montgomery's view, which has, since he wrote, received the most ample confirmation, was that the intra-uterine section was effected, either by constriction exercised by the cord, or by special bands consisting originally of organized lymph, such as is usually elaborated under the influence of inflammatory action. These bands or threads having become fixed round a limb, their compressive power becomes daily augmented, on the one hand, by their own contractions, and, on the other, by the growth of the body within their grasp. In the majority of cases, the complete separation of the limb is not effected, and it is only partially divided. But, if the processes of contraction and growth continue, the supply of blood to the distal part of the limb is first diminished and then cut off; and, ultimately, the nutrition of the bone being similarly interfered with, it becomes brittle, and probably breaks off short at the point of constriction. A most interesting observation, which we owe to Simpson, in connection with this subject, is the occurrence in these instances of an attempt on the part of nature to remedy the deficiency by a process of reproduction which is familiar low in the animal scale, but of which, as we ascend, nature avails herself less and less. When, in a case of this kind, as he shows by reference to a considerable number of cases, separation in utero occurs, a stump is found which offers certain peculiarities in appearance. "Two points of the skin, or rather of the subcutaneous tissue, are found adherent to the ends of the ulna and radius, and present a depressed or umbilicated form, particularly when the forearm is flexed and moved, and the fissures of the skin run in converging lines to these two points as centres. Midway, and a little in front of these two points, the rudiment of the regenerated extremity is situated in the form of a raised cutaneous fold, or fleshy mass, or tubercle, and having on its surface one, two, or more smaller projections or nodules, furnished with minute nails." In illustration of this, the appended engraving is given, representing the stump of the left¹ forearm of a fœtus of the seventh month, preserved in the Obstetric

¹ It is somewhat remarkable that this accident generally occurs on the *left* side.

Museum of the University of Edinburgh. There are five small rudimentary fingers tipped with minute nails, in the usual position on the end of the stump.

FIG. 94

Deviations from the ordinary process of development frequently give rise to results which constitute Monstrosities. The subject of monsters, however, although it might fairly enough be discussed here, is one of such magnitude that we must needs pass it by, as one of which it is impossible to give even the briefest notice in a work such as this. Those who would pursue the subject may refer to the magnificent *Traité de Tératologie* by Geoffroy Saint-Hilaire, and to other works where the subject is fully and exhaustively treated. The Anencephalic, Cyclocephalic, and other varieties, which consist in the absence of portions of the cranium and adjacent parts, are interesting chiefly from a purely practical point of view, as being likely to puzzle any one who, on making a digital examination during labor, might chance to touch such a formation. While the double monsters are, as we shall see, interesting in their practical bearing, as being certain to be attended with difficult labor, the whole subject of monstrosities and malformations is, however, here quite beyond our grasp.

Intra-uterine amputation and attempted reproduction.

CHAPTER XIII.

DISEASES OF PREGNANCY.

SOME DISORDERS WERE EXAGGERATIONS OF CERTAIN SIGNS OF PREGNANCY. I. DISORDERS OF THE DIGESTIVE FUNCTIONS: EXCESSIVE VOMITING: TREATMENT OF QUESTION OF INDUCTION OF PREMATURE LABOR IN—ANOREXIA—GASTRODYNIA—PYROMIS—CONSTIPATION—DIARRHŒA. II. DISORDERS OF RESPIRATION, DYSPNŒA: COUGH. III. DISORDERS OF THE CIRCULATION: CONDITION OF THE BLOOD IN PREGNANCY: DIMINUTION OF BLOOD-CORPUSCLES: PROPORTIONAL ALTERATION IN FIBRIN AND ALBUMEN—SUPPOSED RESEMBLANCE OF THE PHENOMENA OF PREGNANCY TO THOSE OF CHLOROSIS—ADMINISTRATION OF IRON IN PREGNANCY—PLETHORA—VARICOSE VEINS—HÆMORRHOIDS—THROMBUS OF THE VAGINA.

MANY of the symptoms which have already been detailed as indicative of pregnancy are such as, under ordinary circumstances, would be regarded as pathological phenomena, and would be classed as Diseases,

in danger, not from any acute or organic disease, but from the great functional disturbance which, in these peculiar instances, pregnancy provokes. The time at which such symptoms as merit the name of pathological phenomena manifest themselves varies very considerably. Some have their origin in the early months, and such will usually be found, on careful examination, to be purely sympathetic; while those, on the other hand, which do not call for attention and treatment till towards the end of the term of gestation, will be found, as a rule, to be due to some pressure, or mechanical interference with the functions which are disturbed.

Most modern writers, in considering systematically the disorders of the pregnant state, have adopted either the classification of Désormeaux or some modification of it. Following their example, and although we are aware that the classification is open to objection, we propose to divide the affections in question into the following groups:

1. Disorders of the Digestive Functions.
2. Disorders of Respiration.
3. Disorders of the Circulatory System.
4. Disorders of the Secretions and Excretions.
5. Disorders affecting Locomotion.
6. Disorders affecting the Nervous System.
7. Displacements of the Gravid Uterus.

I. *Disorders of the Digestive Functions.*—Vomiting, or rather “morning sickness” is, as has already been stated, one of the most constant, as it is one of the earliest of the signs of pregnancy. Indeed, it may be said that, owing to the intimate sympathy which has been spoken of as existing between the uterus on the one hand and the stomach on the other, almost all pregnant women are affected with it more or less. Sometimes this symptom manifests itself almost immediately after conception—almost always in the course of a few weeks—and it generally continues till the period of quickening has been reached. So long as the vomiting is moderate, it is usual not to interfere, and, indeed, an impression very generally prevails, to which Puzos and others have given expression, that it is a salutary symptom, and midwives have an aphorism that “a sick pregnancy is a safe one.” But in some cases the sickness goes to a very great extent, the woman being constantly nauseated, and the stomach rejecting almost everything, solid or fluid, which it receives. In some of the worst of these cases, it is a matter of constant astonishment how it is possible for the vital powers to be sustained, as everything seems to be ejected almost as soon as it is swallowed. Of course, in all such cases a certain portion of the food must be retained, or the stomach rapidly absorbs a portion before its contents are voided. As a rule the symptom is most violent and most frequently calls for treatment in the case of primiparæ; but it occasionally happens that a woman, who has previously been pregnant without any very marked digestive disorder, may, on a subsequent occasion, undergo the misery of this affection to the fullest extent.

There exists, moreover, a great variety in the amount of pain or discomfort to which the act of vomiting gives rise—some women simply emptying the stomach, without pain or effort, as in the vomiting which is symptomatic of brain disease, while others suffer pain and exhaustion from the excessive retching to an extent which leads us to marvel how it is possible, under such continued spasmodic action, for the uterus to remain quiescent, and to retain its contents. Even in the extreme cases, the emaciation is by no means in proportion to the severity of the symptoms, and the development of the foetus goes on as steadily as if the system were quite unaffected by any disturbing influence.

In the cases which are most intractable, the matters ejected are often mixed with bile; the breath is fetid, and the patient complains of severe epigastric pain. The latter has been relieved by leeching, and sometimes by the application of a small blister to the epigastrium, which may be dressed with morphia. The experience of all, however, who have tried opium seems to be against the use of opiates, at least by the mouth. Sometimes, quite suddenly, and without any treatment whatever, the symptoms cease, after having attained their maximum of intensity; but in other cases they persist, and, if not relieved, reduce the woman to the last stage of exhaustion, when nature at last interferes for her relief by the occurrence of spontaneous abortion—a fact which has been generally received as an indication of the treatment which we should adopt in extreme cases. There is scarcely any form of rational treatment which has not been tried, with a view to the alleviation of this distressing symptom. We shall only mention here, however, such remedies as have been recommended by the best authorities, or have seemed to us to be the most reliable. Narcotics, as a rule, are worse than useless. When the symptoms are slight, and confined to a simple aggravation of the ordinary morning sickness—under which some women are vastly more impatient than others—the remedies employed should be of the mildest possible nature; and in many cases some bitter infusion, or a cup of strong tea before rising in the morning, has quite a decided effect. In several instances we have known the nausea to be greatly relieved and the vomiting entirely checked by breakfasting in bed, and not rising for some little time afterwards. In some, food is only retained when cold; and in others, nothing will lie on the stomach but what is hot. Ice will sometimes check it, and bismuth, in doses of eight or ten grains, has been said by Cazeaux to have a good effect. It will be obvious from these facts that the management of the diet is an important part of treatment, but one which will often perplex us sadly.

The strictest attention must be paid to the state of the bowels, and marked benefit is often derived, in cases where they are sluggish in their action, from a gentle dose of some such mild laxative as Carlsbad salts, Pulna water, or the phosphate of soda. There is, perhaps, no class of remedies which is attended with such beneficial results as effervescing draughts, among the best of which may be mentioned the granular effervescing citrate of magnesia. On the Continent a favorite remedy is the “*potion de Rivière*,” which is prepared and given in the

following manner, so that the effervescence actually occurs within the stomach :

R. 1. Acid. Citric, gr. xxxvj.
Syr Simp., ℥ j.
Aquæ, ℥ ij. S.

2. Potass. bicarb., gr. xxxvj.
Aquæ, ℥ iij. S.

Sig. A tablespoonful of each to be taken successively.

Calumba and soda is a favorite combination with some; and hydrocyanic acid, or creasote, may be tried, although their usual effect is not to be depended upon. Salicin has also been mentioned; and the salts of cerium have been used and strongly recommended by Simpson, but in so far as our experience goes, with no better effect than the other means which have been mentioned. Should there be much exhaustion of the patient's strength, stimulants must be employed; and indeed, these, when taken in moderate quantities, and in an effervescing form, such as champagne, or brandy and soda-water, seem almost to exercise a specific influence. In some cases pepsin is a very valuable addition to other modes of treatment. Sometimes, when such of the above measures as may have been selected, are totally devoid of effect, we stumble fortunately on some agent which may chance to have the desired effect, even though it be of the simplest possible character. Of such a nature is milk and lime-water, and barley-water; indeed, in reference to the latter, we have seen such striking instances of its efficacy, in which it has been retained by the stomach when all else has been rejected, that we have come to look upon it as among the most valuable agents which we have at command. Lumbar pain is sometimes associated with the vomiting of pregnancy, and it is possible that this may depend upon that slight form of uterine inflammation to which Burns refers as a cause of obstinate vomiting. This affords, at least, a rational explanation of the effect of fomentations, hot baths, and, if the patient be plethoric, of leeches applied to the loins, in arresting the vomiting in this class of cases. A beneficial effect is also derived from the use of belladonna, applied either to the abdomen, as recommended by Bretonneau, or administered in the form of pessaries. In some cases, where the irritability of the stomach seems merely to be increased by food and drink, it will be proper for us to sustain the powers of nature by nutritive enemata; and availing ourselves, further, of the possibility of ingestion by the skin, we may give warm baths, to which gelatinous matter, in any form, may be added; or inunction, by means of cod liver or other oil, may be practiced.

But failing all other means, the question remains for our solution, whether we are warranted in imitating what nature occasionally effects by her own efforts, by inducing the premature expulsion of the foetus. We shall not pause here to consider, as some have done at great length, the moral aspects of this important practical question. The idea involved is death to the foetus, in order either to avoid risk to the mother, or to save her life, when that is in immediate and urgent danger; and no right-feeling man can decide in such a case without feeling that a grave moral responsibility rests upon his decision. We apprehend that

when it is a mere question of freeing the woman from the risk of a contingent though not imminent danger, we are in no case warranted in sacrificing the life of the child, and we must therefore dissent from the conclusions of those who would sanction such a proceeding in any condition of the mother short of extreme peril. The conclusion at which Cazeaux and others have arrived is, that under no circumstances are we justified in inducing premature labor for the relief of the vomiting of pregnancy; but to this we cannot assent, although we admit that the cases which would warrant the operation are of extremely rare occurrence. That such cases do occur we cannot doubt, but let the young practitioner be assured that a life-long experience will scarcely bring such a case under his observation, and let him beware, therefore, lest, by exaggerating to himself the importance of the symptoms which are under his observation, he may, in his anxiety, be led into error. For his guidance we would call his attention to the following facts:

1. Cases have been recorded in which death has undoubtedly been the result, during pregnancy, of vomiting, and of the inanition consequent upon it. Two examples of this are narrated by M. Dance, in the "*Archives Générales*" for 1827, where the vomiting began with pregnancy and terminated fatally—in the one case at three, and in the other at three and a half months. Dubois met with twenty fatal instances in thirteen years, and Tyler Smith alludes to two cases "in which the induction of premature labor artificially was so long delayed that the patient died before abortion could be induced." Burns, on the other hand, says that "he has never known vomiting, purely dependent on pregnancy, end fatally;" and a similar observation is made by Désormeaux.

2. Numerous cases are recorded in which the operation was successfully performed, with immediate relief of the symptoms. Such instances, however, while they afford proof of the safety of the operation, are not to be admitted as, in any sense, arguments in favor of the practice; moreover, the result alluded to is far from being invariable.

3. Instances have occurred, in the experience of almost every practitioner, in which the symptoms, although of great severity, spontaneously ceased, and the labor reached a happy termination; and not a few are recorded, on excellent authority, which show that, at the last moment, and in the most desperate case, the symptoms may subside, and an equally satisfactory result ensue. In illustration of this, we may cite the following example, which occurred in the practice of Dubois:

"A young German lady, two and a half months pregnant, had vomited almost incessantly from the first fortnight of her pregnancy. For six weeks she vomited every few minutes, and the smallest spoonful of fluid set up at once the most energetic contractions of the stomach. She was excessively emaciated and feeble; her breath was very fetid. In a word, the symptoms were so grave that M. Dubois called in Chomel. The prognosis of both was almost hopeless, and they left the lady, in the belief that she had but a few days to live. Two days after the consultation, the patient was seized with severe diarrhoea, and from that moment the vomiting ceased, and never returned. She could then take and retain some nourishment, the quantity of which was gradually increased until she regained her strength and full digestive powers."

This woman, then, after being so near death that two such able men

considered it a hopeless case, made a perfect recovery, and carried her child to the full time. Dubois gives, quite frankly, the details of two similar cases, in which he proposed abortion. In both the women refused, and went to the full time.

A review of facts such as these should certainly lead us to use the greatest possible caution, when the question of premature labor comes, in such cases, under our consideration. It is unfortunate that the great majority occur in the early months of pregnancy,—a fact which increases our responsibility. For, if it were essentially a disease of the last, instead of the first weeks, we would provoke labor with much less hesitation, as we would then have a viable child, instead of an embryo, whose expulsion involves its death. The special circumstances which attend every such case should be taken anxiously into consideration, and our verdict must depend mainly upon these, but in full view of the experience of the past.

Among the other disorders of digestion to which pregnancy gives rise, Anorexia is sometimes prominent. The lack of appetite, amounting occasionally to actual disgust and loathing, is most marked in the early months, although not confined to that period. It is to be met by very careful attention to the normal functions, and by regulation of diet. The effect of tonics, although occasionally good, is not to be depended on; and it must always be remembered, in reference to the treatment of this and other disorders of the same class, that although we may mitigate symptoms and deaden sensibility within certain limits, we cannot annihilate the sympathy upon which the manifestation of these phenomena depends. It is far from unusual for the appetite to become depraved in a manner similar to what occurs in chlorosis; and this, in an aggravated form, constitutes the affection known as Pica. What usually occurs in healthy pregnancy is, that the appetite is altered but not depraved—milk, fresh fruits, succulent vegetables, and other articles of diet easy of digestion, being the form of “longing” which prevails. But when this takes a morbid direction, we find the desire for such substances replaced by a craving for raw rice, soap, chalk, cinders, slate-pencil, and even substances more disgusting. If the morbid longing be for such matters as may be prejudicial to health, they must of course be withheld, even by forcible means should this be necessary. It is, however, usual, and is certainly judicious, to humor the tastes as far as is possible, as they not unfrequently point to the class of diet which agrees best with the patient.

Gastrodynia and Pyrosis, if present in any marked degree, must be treated by precisely the same means which we would adopt in the same affection occurring in other circumstances; and for this purpose bismuth, calumba, and antispasmodics, combined if necessary with minute doses of opium, may be prescribed. In heartburn and acidity, Dinneford's or Hendry's fluid magnesia, or the effervescing citrate or bicarbonate of potash, may be administered in each case with every prospect of at least temporary relief to the symptoms. Constipation of the bowels is a very frequent concomitant of pregnancy, and is due to the pressure which is exercised by the pregnant womb upon the bowels, thus not only reducing its calibre, but also paralyzing to some extent its muscular fibres.

In other cases, there is a want of bile, and they who hold that there is during pregnancy a pseudo-anæmic state of the system, attribute the irregularity of the bowels to the same causes which operate in the early stage of chlorosis. In any case, whatever the cause may be, constipation is of constant occurrence, and women who were not previously of a costive habit frequently require laxatives during the whole course of their pregnancy. If clay-colored stools indicate that the function of the liver is interfered with, a few grains of blue pill given occasionally will often do much good. In the opposite condition of diarrhœa, which is by no means unfrequent, we must be careful to discriminate the nature of the case before pushing astringent treatment too far. If it depends upon fecal accumulation, or upon the presence of irritating matter in the alimentary canal, the first step in the treatment must be to clear out the bowels by castor oil, and then to exhibit, if necessary, such astringents as the nature of the case seems to call for.

II. The *Disorders of Respiration*, which accompany pregnancy, are by no means numerous. Dyspnœa is an affection which is very common in the later months, and is then due to the mechanical pressure exercised in the direction of the diaphragm by the expanding womb. Rest, careful attention to the digestive functions, and such arrangement of the dress as may tend to encourage thoracic and relieve diaphragmatic respiration, are the obvious and sole means by which this affection is to be combated. In the last weeks, the falling down of the womb which then occurs, will generally be found to put an end completely to the discomfort to which this affection gives rise. Dyspnœa may, however, exist at any period of pregnancy; and, when it occurs in the earlier months, it is probably due to sympathetic irritation communicated through the nerves. We have known the dyspnœa under these circumstances to be very harassing, and in one instance it was accompanied during the first five months with severe spasmodic asthma in the case of a lady who never suffered from that affection either before or since. Antispasmodics are obviously indicated in such a case, and, in the instance in question, great benefit was derived from a combination of chloroform with bromide of potassium. Cough, the result apparently of mere sympathetic irritation, is also an accompaniment of pregnancy in no small number of cases. It may be found to be associated with congestion of the base of the lungs, or with some more serious affection of these organs. As a rule, it exists independently of any ascertainable pulmonary disorder, but is, nevertheless, frequently spasmodic, and at times so violent as to resemble hooping-cough; and in these cases it may induce abortion. Some combination of sedatives and antispasmodics would be the best form of treatment for such a case,—the symptoms of which are often specially troublesome during the night,—and by promoting sleep, may prevent exhaustion and constitutional disturbance.

III. *Disorders of the Circulatory System*.—Careful analyses have been performed in order to determine the condition of the blood during the pregnant state. Among these, the researches of MM. Andral and Gavarret are conspicuous for the care with which they were conducted, and the interest which attaches to the results which they disclose.

They showed clearly that the plethoric condition of the circulation, which had been believed in by past generations of practitioners (and which was often treated by the ever-ready lancet), did not exist: and not only this, but that the condition which was to be observed in the greater proportion of cases was more of an anæmia than a plethora. The fact is, that, as a rule, an examination of the blood of a woman who is pregnant discloses alterations in the relative proportion of its constituents, which are closely analogous to what we may observe in anæmia from any cause. In the earlier months of pregnancy, it would appear that the blood deviates little from the normal standard, that the corpuscles are present in their usual number, and that the fibrin and albumen are scarcely altered in the proportion which they bear to the other constituents, the former being, if anything, rather diminished. In the later months, however, the blood is characterized by a remarkable diminution in the number of corpuscles, and a considerable increase in fibrin, while the proportion of albumen suffers no marked disturbance, what little change there is being, however, a diminution. An estimate has been made by the same observers, according to which they assume, that if we suppose the average number of corpuscles in the blood of healthy women who are not pregnant to be represented by the number 125, the average in women towards the end of pregnancy is probably not more than 115. If, in like manner, we take 300 as representing the physiological average of the fibrin, the proportion of that constituent up till about the sixth month may be set down at 250, while from this period onwards, during the last three months of gestation, it steadily increases in quantity, and reaches as high in extreme cases as 480. These physiological phenomena accord perfectly with the small clot and buffy coat which has been so generally observed while practicing venesection in the course of a pregnancy. The interpretation, however, which was formerly attached to this was, that the appearance was due to an inflammatory condition of the blood, and was consequently evidence that the practice which was being adopted was rational and judicious; but now, a more correct knowledge of true physiological principles enables us to recognize that such an appearance is quite compatible with the alterations which have been mentioned. In addition to the facts above noted as the result of analytical research, it has been further established more recently that the quantity of iron, as we would naturally expect from the loss of red corpuscles, is decidedly diminished.

Many of the symptoms of pregnancy, it must be admitted,—such as somnolence, weight in the head, flushing, ringing in the ears, and vertigo,—bear a striking resemblance to those which indicate chlorosis. As the lancet has, however, in this country fallen into disuse, it is unnecessary to repeat that such symptoms are no indication whatever of bleeding. There is, indeed, much reason to believe that the errors of a former generation have in this, as in some other respects, led to the absolute rejection of what is a powerful agent in the treatment of disease, and that in avoiding one extreme we have gone to the other. We cannot doubt, however, that in the treatment of the pregnant state this change has had a beneficial result, for with the blood in such a

state as it is now demonstrated to be in the later months of pregnancy, no one even in former times would have thought of bleeding in an ordinary case of gestation. The analogy between pregnancy and chlorosis is most elaborately argued and worked out by Cazeaux, who goes so far as to assume that the system during pregnancy is in a state closely resembling anæmio-chlorosis, and that the treatment of pregnancy should in a great measure be based on a knowledge of this fact. "An animal diet," he says, "and the administration of chalybeates, have for many years seemed to me to be as useful against the functional disorders of pregnancy as against those of chlorosis."

We cannot, we confess, bring ourselves to admit, as Cazeaux seems to do, that an affection identical with chlorosis is a usual and normal condition of pregnancy. To do so would be to admit that a pathological state is the normal accompaniment of a physiological function, a view which we are certainly not prepared to accept. That the phenomena are so far identical has been proved, but there are other explanations which may be offered, which accord better with such analogies as may be drawn from known physiological and pathological laws. We may, for example, accept it at least as possible that the demand which is, under the circumstances of pregnancy, made upon the mother to supply the material necessary for the rapid development of the infant which she carries, may of itself cause what we are accustomed to consider a deterioration in the constitution of the blood. And yet this so-called deterioration may, for aught we know, be a wise provision of nature against the time when this demand shall suddenly cease. Indeed, although we have little fancy for theories in support of which we have no facts to advance, we do think that it is by no means improbable that the vital engine is, for a special purpose, worked at a low power during the last months of pregnancy. In this way at least, the tendency to post-partum inflammatory action may be diminished, as it is only by degrees, after labor, that the blood regains its normal and healthy composition. Or, again, this pseudo-chlorotic state may be in a great measure induced by inadequate nourishment, the result of the nausea and anorexia which so frequently occur. But, whatever the cause of the alteration of the blood may be, it is very doubtful whether iron can with propriety be administered in most cases of pregnancy. In certain cases in which special circumstances have induced us to prescribe it, we have found that its effect was less satisfactory than usual; and, that it did not allay digestive disorders, but rather, from its tendency to increase the sluggish action of the bowels, which is so frequently a complication of pregnancy, seemed, in some cases at least, to aggravate them.

In thus opposing the view that pregnancy should be treated as a disease, when it presents what we recognize as its normal condition, we must guard ourselves from the possibility of misconception. There are cases, undoubtedly, in which the symptoms are such that we are bound to look upon them as cases of chlorosis; nay, we may go further, and admit that such cases are by no means of very rare occurrence. Circumstances render it highly probable that many of the signs of pregnancy are intimately associated with the diminution of the blood-cor-

puscles already alluded to, but it seems somewhat curious that these symptoms are often present during pregnancy, while the healthy ruddy complexion of the patient discourages the idea of chlorosis. In accounting for this, we must bear in mind, as Scanzoni observes, "that there is a form of chlorosis in non-pregnant women, in which the patients, in spite of the fact that the relative quantity of blood-corpuscles has undergone diminution, preserve a quite healthy color, so that it is conceivable that, in pregnant women also, the pale color of the general surface is no pathognomonic sign of a diminution of the blood-corpuscles." To this we would only add, that it consists with the experience of all that pallor is quite as frequent in the early as in the late months of pregnancy, although in the former case the alteration in the relative proportion of the blood-corpuscles is as yet scarcely if at all disturbed.

In a certain number of instances, however, the deterioration of the blood has its origin at an unusually early period, and, running its course with great rapidity, leaves the woman, before many weeks have passed, in a state in which all the symptoms of chlorosis in its higher grade may be manifested; and those symptoms are all the more marked when the chlorosis has preceded conception. In all such cases, the course of gestation is more or less disturbed by the characteristic symptoms of the disease, and an influence is not unfrequently exercised upon the duration of pregnancy by the occurrence of exceptionally violent symptoms, which may give rise to premature delivery. The experience of those who have devoted most attention to this subject seems to show that no hurtful influence is exercised by chlorosis in the progress of labor, but that a common result is that convalescence is greatly protracted, and that there exists an increased tendency to hemorrhage. In which case also, it has been remarked that there is an increased liability to diseases which are the sequelæ of labor, such as Phlegmasia Dolens; and, in the case of epidemic Metria, that disease is apt, when it attacks a chlorotic woman, to assume some one of its more rapid and fatal forms. The treatment of the chlorosis of pregnancy is to be conducted on the same principle as under other circumstances. It will thus consist mainly in careful attention to the general health, special attention being given to the diet, which should in all cases be generous, and contain a considerable proportion of animal food. Stimulants in some form are also indicated, the red wines of Bordeaux, Burgundy, and Hungary, being perhaps superior to all others in the treatment of this class of diseases. In this respect, however, tastes as well as constitutions vary considerably, but, as a rule, the milder stimulants will be found to suit better than those of greater alcoholic strength, unless, indeed, sinking, or even collapse, the result, it may be, of some form of hemorrhage, should call for more energetic measures. The only class of medicines which stand prominently in advance of others in the treatment of chlorosis are of course the various preparations of iron, which should therefore in every case be tried. If the bowels are constipated, the iron should be combined with a laxative, but our own impression is, as has already been observed, that it is, as a rule, less efficacious in pregnancy than under other circumstances.

Plethora, in its wider sense, is a comparatively rare affection of

be to which they give rise, there are scarcely any circumstances which would warrant us in excising, ligaturing, or otherwise operating with a view to the cure of this troublesome affection. Nor is it proper even to apply leeches to the part, if it be true, as has been asserted, that these may cause abortion; and besides, Désormeaux tells us that he has never known the application of leeches to, or incision of, these tumors in pregnancy attended with any durable amelioration in the symptoms. The treatment of hæmorrhoids must consist, therefore, in measures which are purely palliative. If they are painful, sponging with warm water, or fomenting with sponges wrung out of hot water and applied successively as hot as can be borne, is often attended with the greatest possible relief and comfort. Of local applications, nothing perhaps is superior to the well-known Unguentum Gallæ cum Opio. Where hemorrhage is a prominent symptom, it may be necessary to employ more active astringents, but what is more useful is cold injections, which may be quite freely used without risk.¹ It is doubtful whether cold hip-baths are advisable, as the risk in that case of exciting uterine action is increased.

We have already observed, as a sign of pregnancy, the distended condition of the small veins of the vagina, which gives rise to an alteration of the color of the part to a different tint. If the pressure be unusually great, these veins may assume a varicose appearance, but if this only is the result, no interference is necessary, and the inconvenience is but trifling. In another and more severe class of cases, rupture of the distended vessels takes place, and the result is the formation of a livid tumor, usually limited in extent, and situated for the most part in one or other of the labia. This tumor constitutes a Thrombus of the vagina. Its appearance, which is usually sudden, is attended with considerable pain, and its immediate cause, in many instances, is to be traced to blows, falls, or violent efforts of any kind. It is very variable in its course and termination, and may end by resolution like a thrombus in any other situation, in which case it is of very short duration. It may terminate also in rupture, which gives exit to the pent-up blood, and may thus give relief and lead to a speedy cure; or the hemorrhage may be so excessive as to cause great apprehension, and it has even terminated in death. In other cases, suppuration and gangrene have been the immediate effects, and from the latter process a fatal result has also ensued. The condition of the parts during pregnancy renders this affection more serious than when it is independent of the process of gestation, and it is not until delivery has taken place that we can look for cure. This is, however, by no means always the case, for the relaxation which then occurs facilitates the further effusion of blood, and we may therefore have, immediately after delivery, a serious increase in the bulk of the tumor. For a similar reason, thrombus is occasionally developed for the first time after labor, and in these cases there is more danger of its acquiring a considerable size.

¹ Cazeaux recommends the administration every night of a full enema, to be given cold, and when this has been evacuated, a second is to be given, about a fourth of the bulk of the first: the latter to be retained.

two, either during pregnancy, or labor, or afterwards. And with the exception of one case, all the children of these twenty-two women died."

CHAPTER XIV.

DISEASES OF PREGNANCY (CONTINUED).

IV. DISORDERS OF SECRETION AND EXCRETION—PTYALISM—INTERFERENCE WITH FUNCTION OF KIDNEYS AND BLADDER—RETENTION; MECHANICAL OR FROM PARALYSIS—ALBUMINURIA: STATE OF THE BLOOD IN: PECULIARITIES OF THE PUERPERAL FORM: CONNECTION OF WITH PUERPERAL CONVULSIONS: SYMPTOMS, PROGNOSIS, AND TREATMENT—THE PHOSPHATIC DIATHESIS IN PREGNANCY—LEUCORRHOEA AND GRANULAR VAGINITIS—ASCITES—DROPSY OF THE AMNION—HYDRORRHOEA. V. DISORDERS AFFECTING LOCOMOTION—RELAXATION OF THE PELVIC ARTICULATIONS: INFLAMMATION OF. VI. DISORDERS AFFECTING THE NERVOUS SYSTEM—AFFECTIONS OF THE SPECIAL SENSES—EFFECT ON THE MORAL AND INTELLECTUAL FACULTIES—ABDOMINAL AND UTERINE PAIN. VII. DISPLACEMENTS OF THE GRAVID UTERUS—PROLAPSUS—ANTEVERSION AND ANTEFLEXION: SYMPTOMS AND TREATMENT OF—RETROVERSION; HOW CAUSED ORIGINALLY: CHRONIC AND ACUTE FORMS: SYMPTOMS AND TREATMENT OF EACH: OPERATION FOR THE REDUCTION OF—OBLIQUE DISPLACEMENTS.

IV. *Disorders of Secretion and Excretion.*

PTYALISM, which has already been mentioned as a concomitant of pregnancy, is occasionally excessive, and may thus give rise to such annoyance as to cause the woman to apply for relief. It has generally been observed as an affection of the first weeks of pregnancy only, and rarely lasts more than two months: if it be excessive, or of longer duration than usual, it may be relieved by the use of gum arabic, tamarind water, ice, or some gentle astringent.

The function of the kidneys is not, as a rule, in any way disturbed by gestation.¹ It is, however, otherwise as regards the bladder, which from its situation, is peculiarly liable to be affected in its function by the pressure to which it is subjected. Annoyance from this source is seldom experienced in the early months of pregnancy, but, in the last weeks, when the uterus has fallen downwards, as is usually the case prior to delivery, the pressure then brought to bear upon the neck of the bladder, which is compressed between the head of the child and the symphysis, may give rise to intolerable annoyance, for the relief of which, prompt action is frequently required. In many cases, the woman is able to relieve herself perfectly by placing herself on her

¹ The formation of Kiestein has already been referred to.—See "Signs of Pregnancy."

knees and elbows, when, the weight of the child being transferred to the fundus of the womb, the mechanical obstacle is at once removed, and she is able to micturate without difficulty. The cases in which the greatest amount of difficulty exists are those which are accompanied by anteflexion of the womb, when the pressure upon the bladder is for obvious anatomical reasons more severe. Complete retention of urine is occasionally the result, and, in such a case, the bladder may become enormously distended, and in an unnaturally elongated form may reach as high as the umbilicus; and, indeed, cases have been recorded in which death has taken place from rupture of the bladder, and escape of the urine into the peritoneal cavity. Fortunately, however, it is only on rare occasions that the retention is complete, but it is by no means unusual for the practitioner to be summoned to relieve the almost constant irritation from which the woman suffers, in consequence of the difficulty which she experiences in her efforts to empty the bladder. If this difficulty is not relieved by change of posture during the act, an abdominal bandage, carefully adjusted, and worn so as to give support to the uterus, will often be productive of the most satisfactory results. But, failing such means, it will be necessary, in some instances, to use the catheter, and in this manner to relieve the bladder. With the ordinary female catheter, considerable difficulty may often be experienced, as it is too straight and too short to be adapted to the altered anatomical relations of the urethra and bladder; and, indeed, its use is not free from risk. It is, therefore, much better to use an elastic catheter, by means of which the operator will, even in cases of complete retention, rarely fail to effect his purpose. In cases where the compression is comparatively trifling, it may act in another way, by inducing paralysis of the sphincter vesicæ, and a constant escape of the urine drop by drop. In one case, this was observed by Scanzoni as early as the third, and disappeared entirely so soon as the uterus had risen out of the pelvis in the fourth month. Catheterism may be employed as often as is necessary; and the catheter may be left in for several hours, while the woman lies quietly on her back, should the symptoms not yield to the simple emptying of the bladder. Sometimes, in the last months, she experiences a smarting, or more severe pain in micturating, which has been found to depend, in many instances, upon a catarrh of the bladder, or at least of its neck; under which circumstances, whitish flakes and purulent matter in the urine will disclose the nature of the case, for the treatment of which, the only safe means which can be adopted are baths, bland drinks, and emollient applications. This affection may be associated with spasm of the neck of the bladder, which may also exist independently of any local disease, the irritation which causes it being sometimes due to pressure, and at other times to a reflex irritation starting from the uterus.

The existence of *Albuminuria* as a disease of pregnancy, was first discovered by M. Rayer, and in this country was brought under the notice of the profession by Dr. Lever. Previous to this, there can be no doubt that many cases were set down simply as instances of œdema, due to pressure (the *Œdema Gravidarum* of the old writers), which were, nevertheless, caused by the presence of albumen in the urine, or

may be manifested, and the case may continue until the end of pregnancy, with the result of a happy labor and perfect recovery. If the general system seem to participate in the morbid process, and there is lumbar pain and general febrile excitement, great relief will frequently follow the application of a few leeches to the loins, to be followed by diligent fomentation. Antiphlogistic treatment of any kind, more especially in such cases as are not observed until the disease has made some progress, must be resorted to with the greatest caution. For it must be remembered that the disease is one of debility, and implies impoverishment of the blood,—a condition which calls more for a tonic treatment and a generous diet. Baths of various kinds are often useful, being at once grateful to the feelings of the patient and likely to promote the function of the skin. The use of diuretics has also been recommended; but, if used, these agents should be employed cautiously, and in the mildest form. In a case which came under our observation lately, a lady aged 34, pregnant for the first time, had œdema of the ankles about the beginning of the sixth month, when a trace of albumen was discovered,—the urine being very scanty, high-colored, and loaded with lithates. The treatment adopted was the bitartrate of potash, with Rochelle salts and benzoic acid, which kept the symptoms somewhat in abeyance, and manifestly improved the function of the kidney. The general health did not deteriorate, but the general dropsy increased, the quantity of albumen in the urine fluctuating considerably. All went on well, but, in the last stage of a tedious labor, the patient was seized with a most violent epileptiform attack. She was at once delivered with the forceps, made a good recovery, and in six weeks all trace of albumen had disappeared. In the above case, the benzoic acid was given, as recommended by Frerichs, with the view of neutralizing the ammonia which forms in the blood from the decomposition of the retained urea.

Dr. Tyler Smith has pointed out, as an occasional accompaniment of pregnancy, the habitual occurrence of a large quantity of triple phosphate in the urine, which, under the circumstances, is of high specific gravity, and has an alkaline reaction. The same observer has noticed, further, that in some cases in which this phosphatic diathesis has been found to exist, fatty degeneration of the placenta had occurred in successive pregnancies. The treatment of such cases consists in the use of the mineral acids, opiates, rest, and a nutritious regimen.

A hypersecretion of the mucous membrane of the vagina constitutes a troublesome form of *Leucorrhœa*, which is of frequent occurrence during pregnancy. A certain degree of this increase in the action of the glandular structure, is to be looked upon as an ordinary accompaniment of pregnancy, due to the increased vascularity which is inseparable from gestation, and which manifests itself, as we have already seen, in a change in the color of the membrane. This, of course, requires no treatment beyond ordinary attention to cleanliness. But the quantity of the discharge is occasionally excessive, and varies greatly in its appearance, being in one case clear, in another milky, and in a third yellow and creamy like ordinary pus. Such a condition will be found occasionally to be associated with a growth of papillary

run as a consequence of it, we are inclined to look with more favor on the induction of premature labor as the proper measure to resort to in extreme cases. The nearer such a case approaches to the full term of gestation, the less need we hesitate in adopting this course, but even when it involves the certain loss of the child, we believe that the most judicious course would be to adopt this, in preference to paracentesis, at least in the majority of cases.

Dropsy of the Amnion.—There is, as has already been observed, a very great variety, consistently with quite normal gestation, in the quantity of the liquor amnii. It is, therefore, a matter of no little difficulty to determine the point at which the quantity becomes abnormal, but we shall probably not be far wide of the truth if we put down the limit at from two to three pints, so that if the quantity should exceed this, the case may be held to come under the category of dropsy of the amnion. In extreme cases, from thirty to forty pints of fluid have escaped from the uterus. It was at one time generally believed that this form of dropsy was associated with some special morbid condition. It has been supposed, for example, to be due to inflammation of the amnion, constitutional syphilis, or to some diseased condition of the foetus; but, although all these theories are possible, none of them have up to this period been demonstrated. It seldom has been observed before the fifth month, and is much more frequent in twin pregnancies.

If any difficulty should be found in distinguishing between ascites and dropsy of the amnion, attention to the following points, which are laid down by Cazeaux as diagnostic, will generally enable us to make the distinction, if the cases are uncomplicated; but it must not be forgotten that the two affections may coexist. In ascites the urine is scanty and thick, and the lower limbs and genitals are oedematous. There is also fever and constant thirst. It is difficult, if not impossible, to recognize the outline of the uterus, and in the course of our examination by palpation distinct fluctuation is to be detected. In dropsy of the amnion again there is normal urine and little thirst. The lower limbs are often perfectly free from oedema, or, if it be present, it is so to a comparatively small extent. The rounded form of the distended uterus can generally be made out, but the fluctuation is very deep-seated and obscure. There is rarely any umbilical projection, and if so it is not transparent. The distension from dropsy of the amnion is sometimes enormous, and may threaten death by apnoea, by interfering with the function of the lungs. The natural relief which has, in such cases, followed upon spontaneous rupture of the membranes and the escape of the fluid, points very clearly to the only method of treatment upon which we can rely; for, whatever may be the opinions entertained with reference to ascites, there can be no doubt that, in the affection we are now considering, the only operative procedure applicable to cases where life is in danger is the induction of premature labor by rupture of the membranes. If the symptoms are not urgent, and the distension not excessive, careful attention to all the functions is the only mode of procedure which can be adopted, seeing that diuretics and purgatives are of no avail, and besides, that the pregnancy may possibly come to

a satisfactory termination. The result of this affection is very serious as regards the life of the child, but seldom implicates that of the mother, nor indeed, as a general rule, does it seriously affect her health. The natural result is spontaneous premature expulsion.

Hydorrhœa.—In this singular affection, which has also been called “false waters,” a discharge of fluid takes place from the uterus, the amnionic sac remaining entire, and the phenomenon being neither preceded nor necessarily followed by uterine contractions. This occurs pretty frequently towards the end of pregnancy, and even, although the quantity of fluid discharged may have been considerable, and lead to the idea that premature rupture of the membranes had occurred, labor, when it eventually occurs, is found to be accompanied in the first stage, as usual, by the formation of the “bag of waters.” The circumstances under which the discharge occurs vary considerably. In some cases it has an obvious connection with some powerful effort or accidental violence, while in others it comes on while the patient is at perfect rest, or even during sleep. In one case the discharge may occur as a gush; in another it may escape *guttatim*; or, it may come on in either of these ways, and then, ceasing completely, may again and again return. The discharge is, in the first instance, at least, attended by no pain, but in those cases in which the quantity is large and the escape sudden, uterine contractions are apt to supervene, and premature delivery thus to ensue.

The cause and source of a serous and usually colorless discharge which comes from the uterus during pregnancy, and is not the liquor amnii, constitute points of considerable interest, and to account for the phenomenon many theories have arisen. The only one, however, which it is necessary to mention here, as it is that which is almost universally accepted, is that the affection arises from a secretion which has its source in the inner surface of the uterus, and which, in proportion to its quantity, separates the coverings of the ovum from their uterine attachments. A pouch is thus formed between the decidua and the womb, which gradually increases as more fluid becomes effused, until, making its way downwards towards the cervix, it finds a mode of exit, the fluid then escaping into the vagina and making its appearance externally. The occurrence of this should give rise to no apprehension, further than that which may arise from the risk of premature expulsion. The treatment consists in enjoining strict rest in the horizontal posture, in order to reduce this risk to a minimum; and, if the gush has been sudden and the quantity large, it will also be proper, with the same object, to give an opiate in some form, to allay possible uterine excitement. The only practical mistake which might be made in such a case would arise from an error in diagnosis, for if we believed the discharge to indicate rupture of the membranes, we might, naturally enough, rather encourage the coming on of labor, believing that to be inevitable.

V. *Disorders affecting Locomotion.*—Attention has already been directed to the fact now fully recognized, although long disputed, that a relaxation of the various pelvic articulations is an essential and physiological accompaniment of the pregnant state. This consists in a thickening of the cartilaginous, and a softening and relaxation of the liga-

itching of the skin, in the absence of any cutaneous irritation, must also be referred to the same class. Nor do the moral and intellectual faculties escape, in all cases, without suffering material disturbance. The subject of mental alienation in the puerperal state will hereafter be more fully discussed, but there are minor degrees of aberration, both moral and intellectual, which do not amount to, or even approach insanity, but which are by no means of rare occurrence during gestation. Affection may, in this way, be replaced by unaccountable antipathy, a trusting disposition by jealousy, or a temper which can scarcely be ruffled by wanton irritability. Amusing cases are even narrated, in which an inverse process was the result, and in which whole households learned to hail with pleasure the pregnancy of the lady of the house, which was divulged to them by unwonted gentleness of manner and genial cheerfulness. "It is not uncommon," as Burns says, "to find women very desponding during pregnancy, and much alarmed concerning the issue of their confinement." This affection, which closely resembles a similar state occasionally attendant upon disordered menstruation, amounts, when extreme, to melancholia, and seems, in both cases, to have its origin in an irritation which, starting from the uterus, operates reflexly through the nerves. Cheerful society, and careful attention to the diet and bowels, constitute, along with other similar measures, the only treatment proper to such a case.

Pain, unconnected either with uterine contraction, or with inflammatory action, and referable to any one point in the abdomen, is an occurrence which occasionally, from its severity, calls for interference. In a certain number of such cases, there no doubt is, as Scanzoni points out, an abnormal tenderness of the womb, which many have attributed to rheumatism of that organ, during which either the whole womb, or a limited portion of it, may be the seat of very acute pain. When this is the seat of the pain, it is usually referred to the hypogastric region; but there are many other instances in which pain of an equally acute character is experienced in other regions. Pain in the groins has thus been supposed to be caused by dragging on the round ligaments, which will be best relieved by an abdominal bandage and the horizontal posture. Pain in the lumbar region has, in like manner, although on what ground it is not clearly shown, been attributed to stretching of the broad ligaments. Pain and cramps in the thighs are most distressing accompaniments of pregnancy, and are due, in part, to pressure on the sacral nerves, and in part to a reflex action, starting, most likely, from the uterus, but probably, in some instances, from the bowels. The abdominal walls also seem, in some cases, to be the seat of acute and almost constant pain. This occurs during the last months of pregnancy only, and is generally confined to a limited space on the abdominal surface,—so that it is often difficult to convince the patient that it does not mark the seat of some severe local inflammation. All such painful affections as we have alluded to must be treated, during pregnancy, by the agency of measures which are merely palliative, and, in point of fact, palliation is the most that experience of such cases teaches us to anticipate. Warm baths in all cases, laxatives in the case of cramps, rest and local applications for the relief of the pain, are the

down as far as the knees, but it seems likely that in most of these there is an actual hernia of the womb, owing to a separation of the recti muscles, between which it protrudes. This form of displacement may, as we shall have occasion hereafter to observe, cause difficulty in the process of parturition, by misdirecting the expulsive force; but, in every case, the treatment is the same, and consists in an endeavor to support the fundus by bandaging, supplying in this way the support which the abdominal wall should afford; and, in addition, attending to the function of the bladder, remembering always that the greater the displacement of the womb, the greater is the corresponding elongation of the bladder. That organ, indeed, in some cases, loses all traces of a spheroidal form, and assumes the shape of an elongated pouch, which is bent over the symphysis, and which, therefore, can only be conveniently emptied by the use of a long elastic catheter.

Retroversion and *Retroflexion* of the gravid uterus are much more dangerous both to mother and child than displacements in the contrary direction. The distinction between the two varieties depends simply, as the names imply, upon whether the long axis of the uterus is bent or straight, and in each the fundus of the uterus occupies more or less completely the recto-vaginal pouch of the peritoneum. We believe, however, that the distinction which is usually drawn between retroversion and retroflexion, whether occurring in the unimpregnated state or during gestation, is more apparent than real. The great majority of cases will be found, in fact, on careful examination, to be neither exactly the one nor the other, but a condition intermediate between the two, in which the axis of the uterus is neither straight, nor abruptly bent at the os internum like the neck of a retort, but forms the arc of a circle, the imaginary centre of which varies very greatly. We shall content ourselves, therefore, with the expression *Retroversion*, without attempting to draw any formal distinction between the two varieties.

As, in a certain number of cases, impregnation takes place of an ovum contained in a retroverted womb, it is proper to notice here briefly the causes which have been assumed, and to a certain extent have been demonstrated, to lead originally to this displacement. It has been supposed, and we believe with good reason, that there is often an unusual mobility of the uterus in the direction which leads to the displacement we are now considering. This is due to a morbid relaxation and lengthening of the round ligaments and vesico-uterine folds, which thus admit in the first instance of a movement of the fundus backwards, which is encouraged by repletion of the bladder, and still more by overdistension, arising either from carelessness or from any other cause.¹ The

¹ With a view to the elucidation of this subject, Scanzoni made a series of most interesting observations both in the living and the dead. He found, in the first place, that distension of the bladder always caused a certain amount of displacement backwards of the fundus. "We found," he says, "when we artificially filled the bladder in dead bodies, that the duplicatures of the peritoneum passing from the uterus to the bladder, stretched themselves in direct proportion to the distension of the bladder, so that when the bladder was filled and distended as far as possible, this stretching reached to such an extent that it was impossible, without considerable effort, to force the fundus of the uterus backwards for more than a few lines, as its attachment to the posterior wall of the bladder was much more firm than when that viscus was empty. A very different result ensued when we, in the first instance, cut

it is most likely that there is a pre-existing minor degree of displacement, which gives rise to a further and sudden change in the position of the womb, sufficient to cause complete retroversion. Immediately upon the occurrence of this dislocation, or within a very short period, the woman complains of severe dragging pain, which is accompanied by a new sensation, as of a foreign body in the pelvis. This gives rise to

FIG. 95.

Retroflexion of the womb about the 16th week. (After Shulze.)

painful and fruitless expulsive efforts, with increase of the pain around the entire pelvis, and great difficulty in emptying the bladder and the rectum. These symptoms are usually attended with faintness, nausea, and vomiting, and other general symptoms of even greater severity; and, unless the reposition of the organ be speedily effected, this state of matters gives rise to complete retention of urine and obstruction of the bowels, which may, in their progress, result in rupture of the bladder, stercoraceous vomiting, ileus, and such symptoms as precede a fatal result. In many cases,—perhaps in most of those in which the incarceration of the organ is prolonged,—there is congestion and thickening of the uterine walls, and this may sometimes amount to actual inflammation of the organ, which becomes exquisitely tender, and thus aggravates greatly the sufferings of the patient.

The natural termination of a case such as this involves great risk to the mother, and almost certain death to the child. For, although in its further development the womb may possibly take an upward direction, and the symptoms be thus spontaneously relieved (and such cases are on record) the usual result unfortunately is, that the increase of the uterus gives rise to the more serious symptoms above detailed, which can only be relieved by arrest of development, or by expulsion of the *fœtus*. Nothing can, therefore, be more obvious than the necessity which

become impossible, or should any other symptom develop itself which may be held to imply that the life of the mother is in imminent danger, there then remains for us no resource but to imitate nature, and to induce, without delay, the premature expulsion of the foetus. Of the many methods by means of which, as we shall have occasion again to observe, it is possible to induce premature labor, that which is most applicable to the present case is the rupture of the membranes. For the immediate effect, which is thus produced by the sudden evacuation of the liquor amnii, is to reduce the diameter of the uterus, and thus to afford partial relief during the period which intervenes between the operation and the commencement of uterine action. It is, however, by no means an easy matter in every case to effect this rupture, more especially when the os is tilted up behind the symphysis, and is only reached with difficulty, and it may be found necessary on that account to introduce a catheter, with an opening at the extremity, through which a wire may be passed, and having reached the membranes, to thrust the wire through, and thus effect our purpose. But it may happen, unfortunately, that the os is displaced upwards to such an extent that it is impossible to reach it, or at least to pass anything through it; and in such circumstances we have no alternative, if the life of the mother is in obvious danger, but to puncture that portion of the uterine wall which lies lowest, and thus give vent to the amniotic fluid, and afford relief to the patient. It is of course safer, under such circumstances, to puncture from the vagina than from the rectum, but the latter operation has been successfully performed, effusion into the peritoneal cavity having been prevented by leaving the canula *in situ* until the risk of further effusion had passed. The uterus being thus relieved of its fluid contents may now be replaced without much difficulty, unless adhesions should chance to have occurred, and then awakened expulsive effort will speedily relieve the organ of its solid contents. Where reposition of the uterus has been successfully effected, labor may go on without any further accident or hindrance, but in some few instances it would seem that a tendency to relapse remains. This must, therefore, be guarded against, by insisting upon strict rest on the side, and, by the frequent use of the catheter and enemata, to prevent such mechanical pressure from the bladder and rectum as might encourage a recurrence of the displacement.

Oblique displacements of the uterus have been insisted upon by some writers as exercising an important influence on the progress of pregnancy. We know already that the long axis of the gravid uterus does not correspond with the middle line of the body. It is quite possible, therefore, that when this normal obliquity is exaggerated, the os may, for a time, be prevented from dilating by the altered axis of the expulsive force. Such displacements, however, seem to have had their origin, in a great measure, in the imagination of those who have sought to reduce the art of midwifery to a series of geometrical propositions, and are certainly not of sufficient practical importance to require more particular attention.

In addition to the diseases of pregnancy which we have described,

The spinal marrow exercises upon the uterus a very obvious and important influence. There is, in the first place, a direct or centric action, in which the motor nerves are excited by a communication starting from the nervous centre; and it is in this way that ergot and other oxytoxics act, being conveyed to the cord by the circulation, and there producing an effect which is transmitted to the uterus, where it takes the form of muscular action. In this manner, too, many diseased conditions of the blood produce an effect, as is well known, by acting on the cord, and giving rise to different varieties of puerperal eclampsia; and in this way even plethora, or anæmia, may exercise an influence on the dynamic force of the womb. But of much greater importance, and of higher physiological interest, is the diastaltic, or reflex function of the cord, which chiefly presides over the motor functions of the uterus, and which is associated, more or less directly, with the physiological actions and pathological changes of the latter. One of the most familiar instances of this is the uterine contraction which ensues upon the irritation of the nipple by the contact of the child. The impression is, in this case, conducted to the spinal centre, and being thence reflected to the uterus, forthwith acts upon its contractile fibres: and, so constant is this occurrence, that it is admitted in practice as a valid reason for putting the child to the breast at an early period after delivery. A similar effect may be produced, although with less certainty, by an irritation of a similar kind starting from the stomach, rectum, or any other part of the alimentary canal; from the ovary, or from any structure in the immediate vicinity of the uterus; and, finally, from the direct irritation of the organ itself, which may be effected in various ways, the most reliable of which is irritation of the os and cervix, or of the internal surface in the case of hemorrhage. The very extensive nervous sympathy which thus exists between the uterus and so many distant parts shows pretty clearly that its nervous functions are, during pregnancy and the puerperal state, greatly increased. What is known, up to the present time, in reference to the uterine nerves, is by no means very satisfactory; but the result of most modern investigations in regard to these nerves, which are only to be traced with the greatest difficulty, seems to confirm the view originally adopted by Dr. R. Lee, that they undergo, during pregnancy, considerable enlargement,—an enlargement, however, which appears to have its seat mainly in the neurilemma. This subject is one which has given rise to a deal of acrimonious discussion, and is still beset with many difficulties which have only partially been overcome. It was stated in a former chapter that twigs of the sacral nerves, passing to the os and cervix, constitute the channel of communication between the cord and the uterus, but that the rest of the nerves are derived from the ganglionic system. When, therefore, nervous force is reflected upon the uterus from the cord, it passes by the nerves in question, and reaches, in the first instance, the cervix and os. In this situation plexuses are found, to the formation of which the spinal and ganglionic systems contribute, and through these the force is transmitted to the terminal fibres in the body of the organ, where it excites immediate and effective uterine contraction.

the same reason she will eagerly employ the means which are afforded her, by towels tied to the bedpost, or footstools in the bed, to fix the trunk, so as to bring the whole power of the expiratory muscles into play. A minor degree of voluntary expulsive effort, which is in all respects similar, is that which attends difficult defecation. Haller attributed to the abdominal muscles the chief share of the expulsive efforts, but that this is obviously wrong is shown by the fact that in feeble women, in whom the voluntary muscular system is very poorly developed, the delivery is not only effected as easily as in others, but actually, in many instances, with greater ease; and, moreover, complete anæsthesia, which has a most marked effect on the voluntary muscles, scarcely effects in any marked degree the progress of delivery. Another auxiliary force exists, in an advanced stage of labor, in the action of the muscles which constitute the floor of the pelvis, and in the contraction of the muscular fibres which enter into the composition of the vaginal walls. In the lower animals, as is well known, the comparatively feeble contractile efforts of the uterine cornua bring the young successively to the os uteri, when, powerful and violent propulsive efforts being awakened in the vagina, they are promptly expelled. In those animals, therefore, we may look upon the vagina rather than the uterus as the great organ of parturition. What occurs in the human species is precisely similar, only that here the vaginal contraction is subordinate to the uterine, while in rabbits and such-like the converse is the case. That the vaginal expulsive force is by no means inconsiderable is shown by the manner in which the placenta is expelled, and still more, by what involves a more powerful muscular effort—the expulsion of the head in cases of presentation of the breech. In regard to the share which is taken by the muscles at the floor of the pelvis, this, too, is in all probability considerable, and constitutes, no doubt, the “reflected force” of which Solayrès de Renhac speaks in his admirable essay.

The Stages of Labor.—Writers, in considering the physiological phenomena of labor, have uniformly adopted the plan of dividing its progress into various stages. Some have multiplied these stages to an extent which is absurd, as the subject is thus rendered more perplexing instead of being made easy of comprehension to the student. The familiar classification of Désormeaux, according to which labor is divided into three stages, is that which is adopted here.

1st. From the beginning of labor until complete dilatation of the os uteri is effected.

2d. From full dilatation of the os till the birth of the child.

3d. The separation and expulsion of the placenta.

In considering the First Stage of labor, some little difficulty is experienced in determining the exact moment from which labor is to be dated. Long before symptoms of actual labor manifest themselves, certain preliminary processes are gone through, and to this some writers have with much propriety attached the name of the Preparatory Stage. The falling down of the womb, which occurs in the last weeks of pregnancy, may be mentioned as perhaps the earliest of those changes. This, as has already been stated, is usually attended with a marked relief of such symptoms as arise from pressure upwards; but these are

are able during the intervals of perfect rest to hook the finger into the os, and to feel distinctly the presenting part.

It is interesting to observe the effect which is produced on the mother's pulse by the occurrence of a pain. If, placing a finger upon it, we note during an interval of rest the number of beats, and continue the observation, we shall find that, with the commencement of the pain, its frequency is increased, and that, continuing to rise, it attains its maximum along with the pain; while with the subsidence of the latter the pulse falls, and on its complete cessation is found to have fallen to its original rate. This observation, as Hohl points out, may be usefully employed as a test to gauge the efficiency of the pains, for the more marked and rhythmical this variation of the pulse, the more effective is the pain which it at once accompanies and indicates. "When, however," he says, "the rapidity of the beats subsides before approaching the maximum, the pain is too weak; or when the rapidity rises by sudden starts, the pain is a hurried one, and in either case its effect will be imperfect." He assumes that, in an efficient pain of average duration, the increase and diminution of the pulse for each quarter of a minute may be put down as follows:

18. 18. 20. 22 : 24. 24. 22. 18.

It would thus appear that the frequency of the maternal pulse attains its maximum during the first half of the second minute; but it must be understood, in making observations based upon this, that it applies to average pains only, and that towards the termination of labor, when the systemic excitement is intense, the pulse from that cause is often so accelerated that any observation of the kind is impossible. If auscultation be practiced during the pains, we often find that the foetal pulsations are somewhat accelerated, but the effect of a pain tends rather to obstruct than to facilitate the observation of the foetal heart. The uterine souffle, however, undergoes, almost invariably, marked modifications. The situation having been ascertained at which that sound may most distinctly be made out, auscultation is sustained during the continuance of a pain, or of a succession of pains, when the following modifications are observed. The approach of a pain is heralded by a rushing sound, which may indicate muscular action, movement of the amnionic fluid, or movement of the child. Along with this there is a marked increase in the distinctness of the souffle, which is raised in tone and in pitch, and may even become vibrating or musical. Up to a certain point this increases in intensity; but as the pain approaches its acme, the sound becomes as it were more and more distant, and then—when the moment of greatest contraction is attained—very faint or altogether inaudible; while, as the pain goes off, it passes again through those changes in an inverted order, until the tone proper to the period of rest is restored.

We must be prepared in every case for the occurrence of what are called False Pains, in which, although there may be uterine contraction, it is not of a proper kind. The pain in such cases may be severe enough, but it is spasmodic and variable in character, and instead of beginning in the cervix and extending upwards, as in a true labor pain,

yielded to a certain extent, the membranes, which are here separated from their uterine attachment, commence to protrude in the form, first of a watch-glass, and then of the extremity of a pouch or bag, which has been termed the "bag of waters." Following the operation of a very obvious law already alluded to, this phenomenon implies, primarily, an attempt, consequent on the uterine contraction, on the part of the waters, to escape in the direction in which resistance is least. The special function, however, of this bag is to effect the further dilatation of the os, and we can conceive no means which could be more admirably adapted to this object than the graduated fluid pressure which is thus brought to bear upon the os equally in its whole circumference. It constitutes, in fact, in its action during a pain, a hydrodynamic force, which acts at once safely and powerfully upon the whole of the os. But another effect of this action is of even higher physiological interest, for in it we observe a means by which the head of the child is protected from all pressure during the first stage. If we make an examination, in the interval between the pains, when the os is moderately dilated, we can generally feel quite distinctly, through the membranes, the head, or other presenting part, and are able to distinguish, for example, without any difficulty, the different sutures and fontanelles. A pain then comes on; but, instead of the head being driven downwards against the still rigid os, it recedes, and the bag of waters takes its place in effecting that dilatation which, when premature rupture of the membranes occurs, must of necessity be performed by the head itself. And the result, when that occurs, is, as every one knows, protracted labor and increased risk to the child. As the termination of the first stage approaches, the protrusion of the bag of the membranes becomes more and more marked; and as, at the same time, the pains usually become more violent, it often excites our astonishment that rupture is so long delayed, and we look for the occurrence at every pain. The bag by this time forms in the vagina a tumor of considerable size, and, in some cases, where the membranes are unusually resistant, this tumor completely fills the vagina, and even protrudes externally,—a condition which, as we shall have occasion afterwards to notice, constitutes an occasional impediment to delivery. In such cases, the bag of waters, having performed the duty for which it was designed, is no longer of any use, and may, under ordinary circumstances, be ruptured without hesitation.

This purely mechanical force, although we believe it to be the chief, is certainly not the only one which is brought to bear in the course of the process of dilatation. For we cannot doubt that it is powerfully assisted by the contraction of the longitudinal fibres of the uterus, which tend to drag the margin of the os upward at the same time that the fluid is being forced downwards, and some have gone so far as to believe that it is mainly by their agency that the dilatation of the os is effected. Without crediting this latter assumption, we may look upon these longitudinal fibres as antagonistic, in their action, to the circular fibres which surround the os, and thus form a sort of sphincter. While we admit such an action as this, we must not overlook the fact, which has already been demonstrated, that the arrangement of the uterine

from the sensory nerves of the vagina. There is every reason to believe, moreover, that the pressure exercised upon the uterus by the abdominal muscles, constantly increasing as the overdistension of their fibres is reduced, is a supplementary cause of the propulsive vigor of the uterus, which is, by the contraction of the former, more actively stimulated. Violent, however, as the propulsive efforts are, they are not attended with that danger to the integrity of the parts which might, perhaps, have been expected; for so soon as they reach such a point as would seem to endanger the latter, "the short gasp or cry is," as Tyler Smith says, "exchanged for a cry which dilates the glottis, and the pain and contraction subside. This cry is a motor action, excited by the emotion of pain, and instantly relieves the uterus of all extra-uterine pressure. Thus, the glottis may be compared to a safety-valve, which is thrown open by emotion whenever the pressure becomes more than can be borne with safety." The presenting part, which now approaches the outlet of the vagina, soon presses directly upon the perineum, which bulges downwards; and, at the height of a pain, when this bulging is most marked, that part of the child which is to be first born, presents itself at the vulva. This is admirably shown in the accompanying engraving. The rectum now becomes flattened, and the sphincter dilated, so that any fecal matter which may have been lodging there is unavoidably expelled. The margins of the anus being dragged apart, the anterior wall of the rectum thus becomes, as it were, a temporary portion of the perineum, as is shown in the figure, while the perineum itself becomes more and more distended, for which modification, indeed, its structure and the nature of the attachment of its muscles admirably adapt it. The hæmorrhoidal veins are frequently much distended, and the dilatation of the perineum goes on both longitudinally and transversely, in a progressive manner, proportionally to the violence of each pain, with which the perineum projects as far as is safe; while, on the subsidence of the pain, the elasticity of the perineal structures causes the head again to recede.

Alternately advancing and retiring in this way, but always gaining ground, the head ultimately passes the distended aperture in a direction forwards, under the pubic arch, the perineum now presenting the appearance of a thickened membrane. In many cases, the head is arrested by the cessation of a pain, just at the moment when its greatest diameter is encircled by the circumference of the vulva, but it does not now recede. This has been called the stage of "crowning," and may be looked upon as favorable to the integrity of the soft tissues. A final pain now brings the presenting part into the world, and this period which immediately precedes delivery is that at which the suffering of the woman reaches its highest pitch,—sometimes amounting to frenzy,—and it is wisely and mercifully provided, in some codes of jurisprudence, that any act of violence committed at this moment is viewed with special leniency. Upon the birth of the head, the woman enjoys a brief interval of relief, but, the pains soon return, and complete the delivery of the remainder of the child. The external parts, which have become contracted around the neck upon the passage of the head, are again dilated, and the shoulders are expelled. It will be found,

The description originally given by Baudelocque as to the mechanism of the birth of the placenta, has been adopted by almost all modern authors, and the demonstration which has lately been given of it by Schultze, in his admirable *Wandtafeln* (see Fig. 98), is in every respect confirmatory of the views of the great French obstetrician. The description given by them of the process is, that the placenta passes through the vagina inverted, with its foetal or amnionic surface turned outwards, an assertion which, in so far as the *natural* process is con-

FIG. 98.



FIG. 99.

Alleged inversion of placenta in the third stage.

Normal position of the placenta in the third stage.

cerned, is quite incorrect. That the placenta passes, in a large number of cases, in the manner shown in the accompanying figure, is probably true enough, but the reason is, that the practice of pulling on the cord is resorted to with too great frequency in general practice. For if we believe that the normal process is thus represented, it will seem rational enough when delay occurs to pull gently towards the ostium vaginae that portion which nature intends should first be born. In cases, however, which are left entirely to nature, it will almost invariably be found that it is not the foetal surface but the edge of the placenta which presents; and it is this part, overlapped it may be by the membranes, which will be found to pass first both into the vagina and through the vulva. This is the description which has been given by Lemser, Cazeaux, and some others; and, more recently, Dr. Matthews Duncan has, in a paper distinguished by his usual ability, put the matter in a perfectly clear light. In his drawing, which we here reproduce slightly modified, the placenta is shown folded upon itself, with the detached uterine surface turned towards the observer; "but the folds are," as he

with unerring precision deviations from the physiological standard; and this reason alone would suffice as an apology for a branch of practice which some look upon with disdain. But a more important reason still is to be found in the fact that many of the dangers and complications of labor arise so suddenly that, unless aid is at hand, the life of mother or child, or of both, may be sacrificed; for, as at present trained, it is rare to find a nurse who has the skill requisite for the management even of the more remediable complications of midwifery.

There are numerous points of detail which contribute greatly to the comfort of the patient, in regard to which an intelligent nurse is perfectly well informed, and the management of which may be left in her hands, if we have confidence in her ability. This, however, manifestly applies only to the wealthier classes, who alone can command the services of such skilled attendants; but, as the practice of the great majority of professional men extends, more or less, in directions where he has himself to discharge many of the duties which are more properly those of the nurse, it is necessary that every young practitioner should thoroughly understand what these are. And, in any case, the failure of the nurse may devolve these duties upon him, so that it is of further importance that he should be familiar with them, in order that he may be able at once to detect incompetency, and to remedy its defects.

The judicious management of a case of labor may be held to include certain preliminaries in regard to which women, and more especially primiparæ, often require some advice. The systematic neglect of the bowels which women so often practice, is likely, if persisted in, to be a cause of much discomfort; and she should therefore be enjoined on no account, as the period of labor approaches, to neglect this function. In most cases, it is proper, by a laxative given at the outset of labor, or by the administration of an enema, to make sure that the lower bowel is empty; for, if this be neglected, the labor will be much more disagreeable to the accoucheur, and may also be unduly protracted. If her health be tolerable, she must not be encouraged to consider herself an invalid, but should be recommended to take such moderate exercise as may seem appropriate, while the tone and general vigor of the system is to be maintained by a sufficient diet, which may be generous, but not stimulating. During the last weeks of pregnancy, the descent of the womb often renders a woman more capable of moving about, from which "it would almost seem," as Rigby says, "that nature intended she should use exercise at this period, and thus prepare her by increased health and strength, for a process which requires so much suffering and exertion."

The perverted and irregular contractions, to which we have already alluded under the name of "false pains," may cause the summoning of the accoucheur long before his services as such are required. Those pains will often, upon strict investigation, be found to depend upon derangement of the bowels, or upon reflex irritation starting from some other source; and, in this as in many other cases, the success of the treatment will depend upon the intelligent appreciation of the cause. The uterus may be the seat, as every one knows, of congestion, as well as of neuralgic or rheumatic affections, the latter being of much less

liquid extract of ergot. To these may be added chloroform and sal-volatile; and, if we are going to any distance, we should certainly take the forceps, which does not occupy much room in the gig or saddle-bag, whereas its absence may possibly cause many hours of delay, and increase danger. It is the duty of the nurse to provide narrow tape or strong thread for tying the cord, and to have in readiness the abdominal bandage, scissors, hot and cold water, and a supply of napkins; but, as it will often fall to the lot of the medical attendant to see to these preparations himself, he should, at least, be provided with such material as may be depended upon for ligaturing the cord; and we take it for granted that he habitually carries with him scissors and a stethoscope. For obstetric use, a stethoscope with an elastic stem is to be preferred. He should also give a general glance around, and see that everything is ready which may be necessary for the comfort or safety of the patient.

In making an examination, the most convenient position for the accoucheur, as well as the patient, is that which is invariably adopted in this country. The woman lies on her left side, with her back to the examiner, and near the edge of the bed, which must, if necessary, be previously so arranged as to admit of this.¹ The index and middle finger of either hand,—the right being usually preferred, although the left has certain advantages,—being then smeared with lard or oil, are passed over the perineum, and gently into the vagina up to the os uteri. It is usual to select the period of a pain for the examination; but if so, the finger must not be withdrawn until we have examined the parts in

¹ "In the earliest periods of history, women appear to have been delivered in a sitting posture, as is described in the first chapter of *Exodus*. This mode was revived in comparatively modern times; thus Ambrose Paré, in 1573, speaks of a labor-chair, with an inclined back, which he preferred to a common bed. Labor-chairs were brought into very general use upon the Continent in the beginning of the last century by Hendrick van Deventer of Dort in Holland, and, although they have been in a great measure discontinued in modern times, there are still some districts of Germany where they continue to be used. It is a species of *chaise percée*, furnished with straps, cushions, &c., by which the patient can fix her extremities, and thus enable the abdominal muscles to act with the greatest power. In some remote parts of Ireland and also of Germany, the patient sits upon the knees of another person, and this office of substitute for a labor-chair is usually performed by her husband. Labor-chairs, as far as we are acquainted with their history, were never used in this country, nor have they been used for the last century in France, where the patients are usually delivered in the supine posture, on a small bed upon the floor, which has not inaptly been termed *lit de misère*. A modification of the labor-chair is the labor-cushion, first used by Unger, and afterwards by the late Professor Von Siebold of Berlin, and Professor Carus of Dresden: it is a species of mattress, with a hollow beneath the nates of the patient for receiving the discharges which take place during the labor. The patient is compelled to lie upon her back during the greater part of labor, and thus maintain the same position for some time, which must necessarily become irksome and even painful to her. In this country and in Germany the patient is delivered upon a common bed, prepared for the purpose as above mentioned; in England she is placed upon her left side, the nates projecting to the edge of the bed, for the greater convenience of the accoucheur; in Germany—except in Vienna and Heidelberg, where the English midwifery has in a great measure been introduced by Boer and Naegele—the patient is delivered upon her back. In former times, the supine posture was also used in this country, but for about a century the position on the left side has been preferred."—*A System of Midwifery by Edward Rigby, M.D.*

case. The practice of previously smearing the finger with some bland lubricant is resorted to on every occasion in which an examination is found to be necessary, not so much to facilitate introduction,—which the abundance of mucus generally renders easy enough,—as to supply the place of any mucus which may be removed, and in a certain class of cases to protect the finger. The operator should never omit, after an examination, to address a word or two to the patient in a cheerful tone; and, if the presentation be natural, and you are then able to say so, she will always be gratified by hearing that “all is as it should be.”

So long as the os uteri is not fully dilated, or, in other words, so long as the first stage continues, the patient should be encouraged to believe that this is a stage which is merely preliminary to the act of parturition; and that, therefore, she should not lie in bed, but rather walk about in the intervals between the pains, and take such light food as she would under ordinary circumstances. If she can be induced to occupy her attention, as far as possible, by any familiar occupation, however trivial, it will be to her advantage, by relieving the tedium of her suffering. If this cannot be done, her attendants should try, by cheerful conversation, to beguile the time, and to divert her mind from the gloomy apprehensions which are of frequent occurrence at this period. The accoucheur should not remain in the room at this time unless there be any special necessity for it, although he may visit it occasionally. To do otherwise would encourage her to expect assistance at his hands, which it is not in his power to afford; and, moreover, his presence would to her seem to imply that he expected a speedy termination of her sufferings. During this stage the woman is frequently advised by ignorant attendants to press down, and with this view footstools are placed at the foot of the bed, and towels are tied to the bedpost, by means of which she may fix the trunk, and bring the whole force of the expiratory muscles to bear. This acts most injuriously on the progress of the labor, for the stage is one of dilatation, and not of propulsion; and if the muscles referred to are thus brought prematurely into play, the voluntary expulsive force is fruitlessly expended before the stage arrives at which it may properly be employed. Nothing, in fact, is more certain than that any attempt, either on the part of the woman, or, on the part of the practitioner, by forcible dilatation of the os, the administration of ergot, or the exhibition of stimulants, to hurry delivery, must be strictly avoided in the course of the first stage of a natural labor. And, even in cases where its duration is prolonged far beyond the average, this of itself is no excuse for interference, unless the general symptoms indicate that it is our duty to accelerate the labor by such means as are within our reach—a state of matters which is of rare occurrence. When the pains flag, it has often been found that the administration of an enema for the purpose of emptying the lower bowel, acts further as an efficient stimulant to uterine contraction.

The pains usually become more severe as the termination of the first stage approaches, and at this period it is advisable that the woman should go to bed, as there is a risk of the sudden propulsion of the

in others, there is a disposition to waste the force of the expiratory muscles in cries which are worse than useless, and it is in these cases that encouragement should be given. In regard to the means already referred to for fixing the trunk, the accoucheur will use his own discretion as to how far they are to be permitted; for, if the pains are of more than usual violence, we must rather restrain than encourage her efforts, while if, on the contrary, they are slow and inefficient, we may, with perfect propriety, allow of any means which may act by increasing the deficient propulsive force. At any time in the course of the labor, but more especially, perhaps, about the commencement of the propulsive stage, difficulty may arise from retention of urine, in consequence of mechanical closure of the urethra. This requires the use of the catheter, which is to be employed with caution and with due reference, as has already been mentioned, to the anatomical modifications which attend pregnancy. The pressure consequent upon the descent of the head often gives rise to cramps in the thighs, a symptom which sometimes aggravates very greatly the suffering of the patient. We shall not stop here to consider whether this is due to direct pressure upon the large nervous trunks, or to a reflex action; but, in regard to the treatment of what is a troublesome complication, although not a dangerous one, it can only be said that if emptying the bowels by an enema, and warm friction of the thighs should fail to remove the spasm, we can but try such other means of palliation as may occur to us, for in all probability the patient will not enjoy complete relief, until the termination of the labor has removed the cause which is responsible for the symptom in question.

As the head descends in the pelvis, after the termination of the first stage, it not unfrequently happens that the anterior lip of the os remains in an œdematous condition, indicative of pressure of the anterior uterine wall between the presenting part and the symphysis pubis. This constitutes a very manifest impediment to the progress of the labor. It has been said by some of the best authorities that under such circumstances we should never interfere. "All attempts," says Rigby, "to push it up above the head are objectionable, because, in the first place, the finger cannot reach sufficiently high to effect the object, and, therefore, the swelling descends again to its former situation; and, secondly, the efforts to push it up only tend to inflame it, and increase the swelling." To this we must demur. Any attempt, rudely or forcibly, to push up the anterior lip, even when it exists as a manifest impediment, should certainly be avoided; but we are bound to add that, in many cases, it may be pushed beyond the head with perfect safety, and in this way the impediment to delivery may be at once obviated. The swollen part should, during the interval between two pains, be gradually and cautiously pressed up as far as possible beyond the head. If the finger be removed, the tumor descends at once, as Rigby says, but if it be kept in position until the next pain comes on, the head will often pass down, and the cervix be retracted upon it, precisely as occurs at the moment of the passage of the head through the ostium vaginæ, by the action of the levatores ani muscles. This cannot be effected in every instance, but the attempt, if cautiously per-

which, we confess, we can scarcely admit. And this for two reasons: first, because the position on the side, which involves apposition of the knees, is singularly unfavorable to movement of the head in the direction which we have indicated as normal; and, second, because, in a large majority of cases, the separation gives the woman great relief, a fact which is familiar to every experienced nurse.

The most important point, however, connected with this stage of the process is, undoubtedly, the Support of the Perineum—a mode of procedure which is recommended in some form or other by most writers on obstetrics. Many years ago, our attention was, by an accidental circumstance, very particularly directed to this matter, and we published some time afterwards a paper on this subject,¹ which was founded not only on a careful clinical study of the phenomena of this stage of labor when unaided, but also on a critical examination of the views entertained by those who practice support of the perineum, and of the reasons which swayed them. The points brought out were mainly these:

The earlier writers recommended only, in reference to this stage, the free use of lubricants and emollients. About the middle of the last century, Smellie advocated artificial dilatation of the external orifice of the vagina; Puzos, stretching of the parts along with lubrication; and Roederer, pressing of the perineum towards the sacrum; all these modes of treatment differing greatly from the modern procedure. To whom the practice of perineal support is originally due is a matter of doubt, but, in the treatise published by Professor Hamilton of Edinburgh, in 1781, we find it mentioned as a distinct system, applicable alike to natural labor and to that which is in any way abnormal. This author, like Puzos, advocates the use of lubricants, and recommends us to release the perineum when the head is being born, “by cautiously sliding it back over the face and chin of the child.” From this time writers have, in the main, agreed that, by a support of the perineum, lacerations are to be prevented; but they have not agreed as to what “support” is, or to what extent it is to be practiced. It would carry us far beyond the limits within which the subject must here be confined to examine critically the views which are, or have been, entertained by the most approved authorities on this point. We shall, on this account, refer only, and that very briefly, to the opinions which are promulgated by some of the authorities referred to.

Dr. Ramsbotham says: “As soon as the head has come to press on the external parts, it becomes our duty to take our seat by the bedside, and never to move from our position till the child has passed. This we do to protect the perineum and to prevent laceration.” . . . “Place your elbow,” he continues, “against the bedstead, regarding it as a fixed point, and allow the perineum to be forced against your hand.” Fortunately there are few, if any, teachers of midwifery who go to such an extreme in the recommendation which they give to their students; for we believe that support of this kind can scarcely fail to bring about the very accident which we are striving to avert. Dr. Tyler Smith pointed out many years ago, that pressure upon the perineum is

¹ Glasgow Medical Journal. January, 1860.

to gauge with tolerable accuracy the degree of propulsive force which is being exercised. Should this exceed the normal standard, so as to imperil the integrity of the tissues, we must then order all aids to expulsive effort to be removed from the reach of the patient, and at the same time encourage her to cry out lustily during the height of a pain, or, in other words, to make free use of the safety-valve of the glottis. Should circumstances render it expedient to oppose the advance of the head with the view of rendering the process of dilatation more gradual, this should be done, not by pressure on the perineum, but by pressure exercised directly upon the head of the child, which is to be pressed towards the hollow of the sacrum. But the effect even of such pressure is in most cases doubtful, and the greatest possible care must be exercised lest we divert the force which should be expended in the direction of the pubic arch, and, by bringing it to bear directly upon the perineum, thus enhance its risk of rupture.

In all first cases, the fourchette is slightly lacerated, but the rupture seldom extends further. In cases in which there exists morbid rigidity, cicatrices, or a diseased state of the parts, the rent may extend deeply into the perineum, and even in extreme cases through the sphincter into the anus. We must guard, however, against taking too serious a view of such a laceration; for what may seem at the moment of delivery to be a serious surgical lesion, turns out in the course of forty-eight hours, and in consequence of the retraction of the parts, to be but a trifling fissure. It is not, as a rule, by the passage of the head that the most serious lacerations are effected; they are often commenced by this, but it is the passage of the shoulders which extends the rupture. Sometimes, the perineum gives way under an amount of pressure which is comparatively trifling, suddenly yielding in its whole extent like a piece of wet parchment; and it is in regard to these cases that a suspicion has arisen as to the possibility of disease in the structure of the parts. There is also an increased risk of perineal rupture in certain forms of pelvic deformity—such as diminution in the transverse diameter of the outlet. This involves an approximation of the tuberosities of the ischia, and an abnormal acuteness of the subpubic angle—conditions which obviously must make the head pass further *downwards* in the direction of the perineum, before it is possible for it to move *forwards* under the arch. The unskilful use of instruments is also a fertile cause of perineal rupture, and the same may be said of carelessness in operative manipulation. Certain rare cases are recorded in which the child has actually passed *through* the perineum, by forcing a passage through this structure and the anterior wall of the rectum, while the posterior commissure of the vagina remained unruptured.

Rigidity of the perineum is an affection which sometimes causes a very serious impediment to the completion of labor. If it be simple rigidity, unconnected with any lesion, and accompanied with dryness of the parts, the treatment applicable in the case of rigid os may be tried here also, for there is no doubt that in such a case, bloodletting, warm baths, and tartar emetic would have a beneficial action; and there is no reason that we can see why, in such cases, the old-fashioned treatment by lubricants may not be useful. But there are cases in which

rigidity is the cause of rupture; and, when the latter is impending, we may occasionally be justified in making a slight incision with a lancet, or tear with the finger-nail if possible, on each side, as has been practiced by some of the most distinguished accoucheurs. In this case, the laceration which attends the passage of the child is, both in direction and in extent, a matter of very little importance. This is an advice, however, that one is almost afraid to give to the inexperienced, as there is much risk of its being improperly and unnecessarily resorted to. The treatment of perineal laceration will be referred to in another place.

When the passage of the head is completed, we should ascertain if the cord is around the neck, and if so, it must be slipped over the shoulders, or pulled down so as to protect the neck from injurious pressure. One hand is to be placed over the fundus uteri, which is to be gently pressed, and followed in its descent by the hand,—a practice which tends to promote the speedy separation of the placenta. Unless there are symptoms of threatened asphyxia in the child, or circumstances which demand immediate delivery, we should not in any way interfere in the birth of the trunk, which will be naturally effected after a short pause, generally counted by seconds. We must now place the child in such a position as will enable it to breathe freely, and should efficient respiration not immediately ensue,—the best evidence of which is a loud cry,—it will be our duty at once to adopt such means as are best suited to excite respiratory action. The stimulus afforded by exposure to the external air, along with certain centric causes arising from deficient aeration of the blood, are generally sufficient to excite the muscles which contribute to the act; but, should these fail, it will be proper, by blowing on the face, a smart pat on the nates, or sprinkling with cold water, to set the function going without delay. Failing this, the infant should be plunged in a basin of warm water, and cold water plentifully dashed upon it as it is removed from the bath. The tongue should be drawn forward, the mucus rapidly removed from the fauces as far as possible, and regular attempts at artificial respiration persevered in so long as the slightest action of the heart continues. In cases of suspended animation, the cord should not be tied until it has ceased to pulsate, as there is a possibility, in such circumstances, of a certain amount of placental respiration. The child is also threatened with asphyxia in cases where it is born along with the unruptured membranes, and thus remains, after its separation, enveloped in its intra-uterine coverings and bathed in the liquor amnii. In this case the membranes must be instantly ruptured, and the possibility of aerial respiration thus established.¹

The infant being born, and having given proof of its independent existence, our next duty is to ligature and cut the cord. The material to be used as a ligature is a matter of no very great moment, provided it be of sufficient strength,—some preferring strong thread, and others

¹ In this case the child is said to be born with a "Caul." It is supposed to be indicative of good luck and prosperity, and in seaport towns the caul is carefully preserved, and is believed by the credulous to be a talisman which protects the wearer from death by drowning.

a material which, while it compresses efficiently, is not so incisive as the ordinary surgical ligature, by which the gelatin of Wharton is actually cut. The material preferred by the latter is strong narrow tape, of which the narrow red tape of national tradition affords a good example. The ligature should be placed about two or three inches from the umbilicus, and should be drawn with sufficient tightness to prevent the possibility of oozing. The knuckles should be brought together, while the knot is being drawn, to steady the hands; for, were the ligature to snap, in the absence of this precaution, the funis might be torn from the umbilicus or its placental attachment, and thus give rise to much trouble and some risk. The reason of applying the ligature at such a distance from the umbilicus, is to leave room for another should the first fail. It is usual to apply a second ligature on the placental side of the first, and to cut the cord between the two; but the advantage of the additional one consists entirely in preventing the fluid contents of the umbilical vessels from further soiling the bed linen. In reference to this, Dr. Dewees, who disapproves of the application of a second ligature, observes that "the evacuation from the open extremity of the cord will yield two or three ounces of blood, which favors the contraction of the uterus and expulsion of the placenta." In the case of twin pregnancy, a second ligature should always be applied, as the cords occasionally communicate. The cord may be divided by a pair of blunt scissors, for the more the walls of the vessels are lacerated, the less likely is subsequent hemorrhage to occur.

The child being separated and handed to the nurse, there only now remains, to complete delivery, the Third Stage, or expulsion of the placenta. If we do not feel that the uterus is firmly contracted behind the symphysis, we should now attempt by friction over the fundus to excite it to contraction; if, on the contrary, it is quite firm, the case should be left absolutely to nature. If, in the course of fifteen or twenty minutes, no attempt at expulsion shall have occurred, we should pass a finger into the vagina, using the cord as a guide, in order to ascertain whether or not the separation of the placenta is complete. When, with a single finger, we can reach with ease the insertion of the cord, we may infer that the placenta, or at least the greater part of it, is in the vagina, and under such circumstances we may attempt to hook down the edge of it, at the same time drawing gently on the cord. But when we find the cord passing up into the uterus beyond our reach, the edge of the placental mass which presents at the os uteri being alone accessible, we know that the placenta, although probably completely separated, has not as yet been expelled from the uterus, and we wait for a further period of ten or fifteen minutes, attempting the while, by renewed frictions, and so forth, to awaken the dormant uterine energy. It will be necessary, however, in a certain number of instances, to assist nature in the completion of this stage. An intelligent apprehension of the manner in which the placenta is naturally expelled, which is described in the preceding chapter, will prevent us under such circumstances from doing, what is too common in midwifery practice, viz., forcibly pulling on the cord. In a large proportion of cases, the delivery of the placenta will doubtless by this means

in which case they have sometimes a **T** bandage attached to keep the napkin in contact with the external parts. In ordinary practice, nothing is better than a bolster cover, which when pinned firmly over the abdomen, serves the purpose admirably.

So soon as the bandage has been applied, and the comfort of the mother otherwise attended to, the nurse is at liberty to dress and attend to the child. The patient must be strictly enjoined to maintain the horizontal position, as fatal cases have occurred in women who had imprudently assumed the erect posture shortly after delivery, and had thus established such hemorrhage as immediately proved fatal. A single glass of sherry or claret with water may be allowed; but it is truly astonishing how seldom this is necessary, so admirably is the effort even of weakly women compensated for. It is advisable for the practitioner not to leave the house too hurriedly, until he feels confident that all is well, and, more especially, that there is no tendency to post-partum hemorrhage. An excellent physiological method of averting the latter, is to put the child early to the breast, which seldom fails to excite reflex uterine contraction; and this acts otherwise advantageously, although there is no milk in the breasts, by drawing out the nipples.

CHAPTER XVII.

THE MECHANISM OF LABOR.

IDEAS WHICH LABOR INVOLVES—DIFFICULTY AND IMPORTANCE OF THE SUBJECT—HISTORICAL SKETCH: VIEWS OF SIR FIELDING OULD; OF SMELLIE; OF SAXTORPH; OF SOLAYRÉS DE RENHAC; AND OF NAEGELE—NATURAL AND FAULTY PRESENTATIONS—CRANIAL POSITIONS: OCCIPITO-ANTERIOR AND OCCIPITO-POSTERIOR—FIRST POSITION: PELVIC OBLIQUITY: OCCIPITO-FRONTAL OBLIQUITY, OR FLEXION: THE HEAD “AT THE BRIM:” EXAMINATION OF FONTANELLES AND SUTURES—ROTATION: CAUSES OF—THE “PRESENTATION,” OR “PRESENTING” POINT—THE CAPUT SUCCEDANEUM—THE CHIN LEAVES THE CHEST—FURTHER DESCENT AND BIRTH OF THE HEAD—OBLIQUITY AT THE OUTLET—MOULDING—EXTERNAL ROTATION OR RESTITUTION OF THE HEAD—SECOND POSITION: THE CONVERSE OF THE FIRST—RÉSUMÉ OF MECHANISM IN OCCIPITO-ANTERIOR POSITIONS.

THE primary idea of Labor comprises three secondary ideas: a body which is to be propelled, a force by means of which the propulsion is to be effected, and a passage through which it takes place. The mechanism of birth thus includes, in its most comprehensive sense, all mechanical questions which spring from the elaboration of these three ideas. The various points connected with the anatomy of the parts, and arising from a consideration of the various forces which contribute to effect the expulsion of the child, having been already fully discussed

in preceding chapters, there remains still for careful study, the relation which the body propelled bears to the canal during the different stages of labor. It is in this higher though more restricted sense that the term Mechanism of Labor is employed, and a study of this subject includes, therefore, a thorough and critical examination of the physical laws according to which the process of parturition is, in the human race, effected.

A knowledge of this section of the subject has been fitly described as the keystone of the art of obstetrics. For, without an intelligent apprehension of the various doctrines involved, the practice of midwifery is reduced to a mere handicraft, in which a certain amount of manual dexterity may be attained, but which, under such circumstances, is utterly unworthy of the dignity of a science. We cannot, therefore, too earnestly, or too emphatically, urge upon the student the necessity of mastering at the outset this important subject, upon which a great part of what is to follow is founded. It is not by any means an easy matter, just at first, clearly to understand the descriptions given in books, or to follow the process as described at the bedside. This demands sustained attention, and a perseverance which is apt to be baffled by the peculiar circumstances under which the investigation is conducted. We may here mention shortly what the chief difficulties are, and how they may in some measure be avoided.

The most effective descriptions, and such as are most useful to the student, are, undoubtedly, those in which unnecessary complication is most scrupulously avoided, and in nothing is simplicity more essential than in the various classifications of labor according to the position of the child within the pelvis. A simple system ought, therefore, in every case to be preferred; in regard to such as are more complicated, it has been well observed that divisions and subdivisions may be multiplied almost at will. The chief difficulty of the beginner arises from the somewhat complex mental process through which alone he can determine the exact position of the child in any given case—a difficulty which the obstetric position in this country somewhat increases. For not only have we to figure to ourselves the child with its axis inverted—standing, so to speak, upon its head, which is towards the os uteri—but we have also to allow for the position of the woman, lying, as she does, horizontally, or with the long axis of her body at right angles to that of the accoucheur. Some of this difficulty is avoided by remembering that in almost all cases the right side of the child corresponds to the right side of the mother; that its back is turned to her anterior or abdominal surface, and that its head is downwards in the direction of the os. These are the first points which it is necessary clearly to understand in regard to the position of the child in natural labor; but, essential as such preliminary knowledge is, it has no direct reference to what is known in modern times as the mechanism of labor.

The facts just stated comprise wellnigh all that was formerly known in reference to the position of the child during labor, and their observation led to very erroneous conclusions as to the manner in which the birth of the child took place. Until 1741, it was, in fact, assumed that there was no special mechanism of labor beyond the mechanism

which attends any vital expulsive act, and that the passage of a fæcal mass or a half-organized clot was as little regulated by fixed mechanical laws as was the birth of the child. The universal belief was, that the child lay in the womb with the face directly backwards; and that, in its descent through the pelvis, it never altered this position in its course from the brim to the outlet, "so that," to use the words of one of the writers of that period "it seems, when she lies upon her back, to creep into the world on its hands and feet." As in regard to most great discoveries, so in this instance was the development of more correct views a gradual process, and the result of the investigations of successive observers. It was from first to last a process, in the case at least of those who contributed in any considerable degree to its advance, of close inductive reasoning, according to which, step by step, during a period of about eighty years, the subject gradually emerged from obscurity. Nothing tends so much to impress upon the mind the great facts which have been disclosed in the course of this investigation, as a narrative of the successive steps by which the truth was ultimately attained; and we shall, therefore, here call attention to the more important contributions which have from time to time been made in this direction.

The honor of the first step in the process of demonstration is undoubtedly due to Sir Fielding Ould of Dublin, who published to the world, about the date above mentioned, a statement to the effect "that the breast of the child does certainly lie in the sacrum of the mother, but the face does not; for it always (when naturally presented) is turned either to the one side or the other, so as to have the chin directly on one of the shoulders." The idea here involved is the twisting of the neck, so as to bring the long diameter of the head into the same diameter as that of the shoulders, the greatest diameter both of the head and the trunk being thus arranged so as to avoid the limited antero-posterior measurement of the brim. The step next in succession was achieved by Smellie. This excellent obstetrician, whose work is still deservedly ranked among the classics of English midwifery, confirmed Ould's observation that the long diameter of the head occupied the transverse diameter of the brim, as it found, in that direction, the most ample accommodation. But to this, he adds, as the results of his own observations, that the long diameter of the head *rotates at the outlet into the antero-posterior diameter*, which his measurements, allowing for the recession of the coccyx, clearly indicate as the best. In many respects, the views enunciated in this admirable work come much nearer the truth than some of a later date; and its translation into several Continental languages brought the opinions of the author prominently under the observation of the medical schools of Europe. From that time, indeed, no writer of note in any language has failed to pay his tribute of admiration to the importance of Smellie's works, and the genius of their author.

The work of Smellie found Continental obstetrics in a most unfavorable state as compared with the English school, and provoked much unfavorable criticism. Steadily, however, his ideas gained ground, although considerably disturbed by the excitement of those who joined

immediately preceding: "No other work of equally small size," as Dr. Tyler Smith well observes, "ever exerted greater influence upon any branch of medicine than that of Naegele upon midwifery. It may be termed, indeed, the Euclid of Obstetrics; but it will not have executed its mission until every accoucheur, in each individual case coming before him, entirely masters the position of the foetal head. Nothing less than this should be aimed at by every obstetric practitioner." Without in any way attempting to detract from the merit of Naegele,—a merit which will have its recognition so long as medical science has a name,—we believe that the views promulgated by him have been too implicitly believed in and adopted by the great majority of obstetric writers. The translation of his essay by Rigby, and the enthusiastic defence by the latter of every theory and doctrine which emanated from his master, produced a powerful impression; and, in point of fact, from that time, English writers have, with few exceptions, reproduced, without modification, and as demonstrated facts, the whole of the conclusions of the great German obstetrician. Indeed, it is not too much to say, that the view generally entertained, even by the ablest writers, amounts to this,—that the subject had been so expounded by Naegele that there was nothing further to demonstrate, that every problem and theorem was solved, and that his conclusions were to be accepted as an absolute solution of all the difficulties and the perplexities of the past.

Some have ventured, however, both in this country and abroad, to demur to this, and to assert that the matter is not yet set at rest, and that the *ipse dixit*, even of Naegele, is not to be admitted as infallible. And, indeed, if we reflect as to what was the state of the subject when he wrote, while acknowledging that there is that in his discoveries which merits all the fame which attaches to his memory, we can scarcely conceive it possible that one mind could so grasp all the details as to make chaos order, and leave no point unassailable, and no question unsolved. In forming his conclusions, no one could be more earnest and faithful in his observations of nature than Naegele; but, in some respects at least, he was mistaken, and from some of his facts he drew erroneous inferences. To him is due the whole credit of showing,—although he exaggerates it,—that the head lies in the right oblique diameter in a preponderance of cases such as had never been dreamed of. He demonstrated also, what every intelligent accoucheur has corroborated many times in his own practice, the rotation which naturally occurs in occipito-posterior positions of the head. And he showed that, in ordinary labor, the forehead does not rotate completely into the hollow of the sacrum, but still retains, in a certain degree, its oblique position. Finally, he asserted, and is admitted by most systematic writers to have proved, that there exists, on the part of the head in its descent through the pelvis, a *biparietal* obliquity, according to which one ear is approximated to the corresponding shoulder. We accept, in general terms, all his conclusions, with the exception of the last, to the investigation of which we have devoted much time and patience, and conclude, unhesitatingly, with Velpeau, Cazeaux, Matthews Duncan, and many others (the number of whom is constantly increasing), that

no such biparietal obliquity as Naegele described exists as a normal phenomenon of natural labor.¹

Presentations.—The term “presentation” is generally held to imply the part which presents, and has no reference to “position,” which is used in another and more restricted sense. We speak, therefore, of presentation of the head, of the breech, of the shoulder, and so on, as representing the part which occupies the os uteri. The presentations may be multiplied to any extent, as there is scarcely a single point on the surface of the child’s body which may not, under certain circumstances, present. In proceeding to the consideration of the various presentations which it is necessary specially to describe, and remembering the position and attitude of the foetus within the womb, we recognize the fact that it forms an irregular oval. By either end of this oval the delivery may take place naturally, so that we may consider as Natural Presentations all the varieties known as cranial, breech, knee, and footling cases. When the child lies transversely, the shoulder, or some other part of the superior extremity,—or, in other words, the side of the oval,—presents; and as those cases can rarely be terminated by the unaided efforts of nature, they may be termed Faulty Presentations. The following table, which is given by Dr. Churchill, will give some idea of the relative frequency of the various presentations, as deduced from the practice of different individuals:

Author.	Total No. of Cases.	Head Presentations.	Breech Presentations.	Inferior Extremities.	Superior Extremities.
Mad. Boivin, . . .	20,517	19,810	372	238	80
Mad. Lachapelle, . .	15,652	14,677	349	255	68
Dr. Joseph Clarke, .	10,387	9,748	61	184	48
Dr. Merriman, . . .	2,947	2,735	78	40	19
Dr. Granville, . . .	640	619	2	8	1
Edinburgh Hospital, .	2,452	2,225	17	8	4
Dr. Maunsel, . . .	839	786	...	21	4
Mr. Gregory, . . .	691	645	14	7	4
Dr. Collins, . . .	16,414	15,912	242	187	40
Dr. Beatty, . . .	1,182	1,105	28	15	4
Mr. Lever, . . .	4,666	4,266	59	29	12
Dr. Churchill, . . .	1,640	1,119	35	22	9
Drs. McClintock and Hardy, . . . }	6,634	5,815	140	61	26
Drs. Sinclair and Johnston, . . . }	13,748	11,874	309	181	60

The enormous preponderance of cranial over all other presentations renders a study of the former by far the most important. We shall, therefore, in the first place, direct our attention to the different varieties

¹ To examine critically the views of Naegele on this subject would involve the introduction of controversial matter quite unsuitable to a systematic treatise. We feel, however, that Naegele’s views have such a hold on British obstetrics, and demand, as well as deserve, such earnest consideration, that we do not consider ourselves justified in passing over with a simple denial any statement to which he has lent the weight of his great authority. We reproduce, therefore, in the form of an Appendix, the reasons which have induced us to reject Naegele’s dictum on this point. (See Appendix.)

of cranial presentations. In respect of the difficulties which the student will encounter, in his endeavor to master this subject, it has already been confessed that these are not inconsiderable. But it is only at the outset that real difficulty will be met with. With every case we observe, and every minute we devote to the subject, what seems almost insurmountable at the first glance will melt away. More and more clearly, as we grapple with the minor difficulties which now arise, do we discern the great truths upon which the science and art of obstetrics depend. Having once fairly mastered the subject, we can never forget it, and so habitual and automatic will our observations become, that we shall find ourselves unconsciously adding to our stock of knowledge, and storing up valuable facts which will stand us in good stead in many an hour of difficulty and danger. But, if the student, at this period of his career, fails to acquire the requisite amount of knowledge which enables him to perfect the *tactus eruditus*, he will most likely never rise beyond a certain point in obstetrical and scientific knowledge. Success after a fashion he may reach, but his attainments will never much surpass those of an intelligent midwife. Once more, therefore, we would urge upon the beginner, with what emphasis and earnestness we can command, to lose no opportunity of acquiring sound knowledge on so important a subject. Without it, the practice of midwifery is weariness and drudgery; with it, it is a subject of constant interest, worthy of, and affording ample scope for, the highest scientific acumen.

As the occipito-frontal or long diameter of the child's head *may*, in a presentation of that part, lie at the brim of the pelvis in the conjugate, oblique, or transverse diameter, or in any diameter intermediate between these, the number of Cranial Positions may be multiplied to any conceivable extent. Admitting the possibility of all of these, we at the same time recognize the fact, which Solayrès de Renhac has so clearly demonstrated, that the occipito-frontal diameter of the head of a mature child enters a normal pelvis in one or other of its oblique diameters. This admits of but four cranial positions, depending upon the direction in which the poles of that diameter are turned. In two, the occiput is turned forwards; and, in two, it is directed backwards: these are called respectively Occipito-Anterior and Occipito-Posterior. Four Positions, therefore, are described, which are termed First, Second, Third, and Fourth:

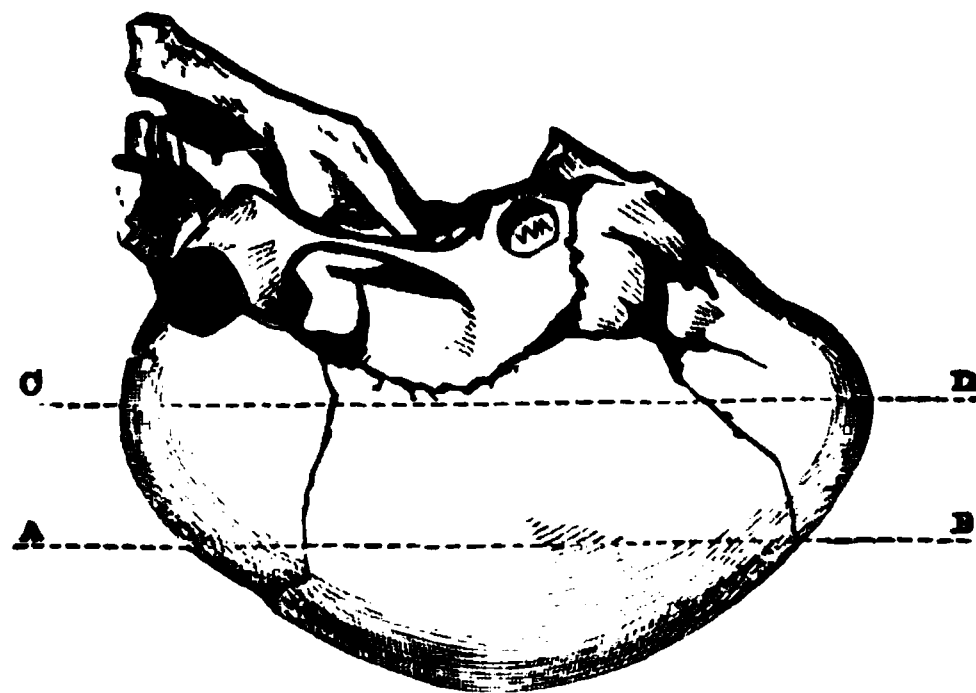
OCCIPITO-ANTERIOR,	{	<i>First Position,</i>	{ Head in Right Oblique Diameter; forehead backwards.
		<i>Second Position,</i>	{ Head in Left Oblique Diameter; forehead backwards.
OCCIPITO-POSTERIOR,	{	<i>Third Position,</i>	{ Head in Right Oblique Diameter; forehead forwards.
		<i>Fourth Position,</i>	{ Head in Left Oblique Diameter; forehead forwards.

First Position.—The head of the child, which occupies generally, above the brim, a position approaching the transverse, with the face to the right, assumes, as it enters the pelvis, in the great majority of cases, what is called the first position. The centre of the occiput is turned towards the ilio-pectineal eminence on the left side, while the forehead

is directed to the right sacro-iliac synchondrosis. The long diameter of the head thus lies in the right oblique diameter. So soon, however, as the head encounters resistance in its descent towards the cavity, its long diameter ceases to be parallel with the plane of the brim, and nothing can be clearer and more obvious than the advantage which is thus obtained. For this *occipito-frontal obliquity* not only involves the passage of the occiput in advance of the forehead, in a degree proportionate to the amount of resistance, but, involving as it does a flexure of the neck, it thus enables the propulsive force to operate at a greater mechanical advantage, so soon as the chin becomes applied to the sternum. It is, in fact, the *vis a tergo* which causes the obliquity, as is most admirably described by Solayrès in his account of the position which we are now considering. The propulsive forces which impel the foetus so situated, are communicated, in the first instance, to its vertebral column, the articulation of which with the base of the skull is much nearer the occipital than the frontal pole of the long diameter. This of itself, supposing the resistance to be equal all around, would be sufficient to cause the occiput to take precedence of the forehead; but the movement is further encouraged by the curving of the spinal column through which the force is transmitted.

No term in midwifery is more loosely used than the expression, "at the brim." In reference to this, we observe that the head, in passing the brim, offers, first, the vertex,¹ then its transverse or biparietal measurement, and lastly, its long or occipito-frontal diameter, so that although a considerable portion of the cranium has passed the brim, and consequently occupies the cavity, it cannot be said to have cleared the brim until the occipito-frontal diameter has passed. A reference to Fig. 101 will render this more intelligible, the line A B there indicat-

FIG. 101.



Cranial planes as they engage in the brim.

ing the biparietal plane, and that which is marked C D the occipito-frontal plane, which cannot pass the brim until the former has descended some little way into the cavity. The occipito-frontal obliquity, or flexion of the head, no doubt, disturbs in some measure the idea thus

¹ For definition of this term, see p. 134.

expressed, but this, we believe, can only take place when the resistance is considerable, and occurs at an earlier stage than usual. We hold the head, therefore, to be "at the brim," in the proper sense of the term, when the long diameter occupies its plane; but as this can only be approximately ascertained, it cannot be held as a definition which is practically satisfactory. It is better, however, than using the term, as many seem to do, without attaching to it any clear meaning whatever.

While the head occupies the position indicated in Fig. 102, which we assume to be at the brim—and in which flexion has not as yet occurred—it is scarcely likely that what we have described as the first

FIG. 102.

First cranial position.

stage of labor has, as yet, terminated, or even that the os has reached such a degree of dilatation as to admit of a thorough vaginal examination. In making such an examination at this time, the first point to be remembered is the relation which the finger bears to the uterus and its contents; for most incorrect views will inevitably be adopted if we overlook the fact that the axis of examination forms, with the axis of the uterus and that of the brim, pretty nearly a right angle. The part of the foetal cranium which is lowest in the pelvis, and which the finger first touches, is the right parietal bone in the neighborhood of its tub.¹ But, if the finger be pushed further back, so as to reach the point on the surface of the foetal cranium through which the axis of the brim may be presumed to pass, we shall find that this corresponds to some point in the line of the sagittal suture, nearer to one or other fontanelle in proportion to the degree of flexion.

The descent of the head is not, in the first part of its course, in a direction which is identical with what has been described as the axis of the pelvic canal. Its movement is, in fact, directly downwards and backwards in the axis of the brim, until it approaches the floor of the pelvis, and experiences the resistance to its advance arising from the gradual approximation of the ischial planes. Upon the degree of flexion depends entirely the extent to which the occiput is in advance

¹ This is one of the points upon which Naegele founded his belief in the existence of biparietal obliquity. Our reasons for dissenting from this view are fully given in the Appendix.

which the phenomenon in question depends. Modern investigation has, however, proved that it is due to the nature of the opposing force which exists at the floor of the pelvis. If we look at the internal lateral surface of the pelvic cavity, as it is here represented, we observe that the tip of the ischial spine is the point which encroaches furthest upon the transverse measurement of the pelvic canal. The head, therefore, as it descends in the right oblique diameter, in the position which we are now studying, arrives at the floor of the pelvis with the occiput in front of the left ischial spine and, as a consequence, the forehead behind the right spine. Rotation backwards of the occiput or forwards of the forehead is thus effectually prevented. As the propulsive stage advances, the occiput is conducted downwards and forwards by the inclined plane formed by that portion of the ischium which is in front of and inferior to its spine, and by the obturator internus muscle; while on the other side of the pelvis, and on a higher level, the forehead is directed by the yielding sacro-sciatic ligaments towards the hollow of the sacrum. These two surfaces, then, are inclined planes which constitute the female screw, while the male screw is represented by the child's head; and we fully agree with Dr. Tyler Smith, that "the key to the pelvic mechanism, in an obstetric sense, may be said to be the spinous processes of the ischia." Some writers, it may be here observed, describe a posterior inclined plane of the ischium, which is separated from the anterior by an imaginary line leading from the spine of the ischium in the direction of the ilio-pectineal eminence. (See Fig. 15, p. 44.) This they suppose to act, in reference to the forehead, as the anterior plane does with the occiput. No such action can, however, be performed by this plane, as the forehead impinges upon the spine and margin of the great notch, and is at once conducted to the ligaments along which it glides.

We have already used the term "Presentation" in its broader signification. There is, however, another sense, in which it is employed by all British and American obstetricians, which here calls for some special notice, as there unfortunately obtains, in regard to this, as well as other terms in English midwifery, the objection that each writer is left to attach to it his own meaning. The Presentation, in the second and more limited sense, is not the part of the child, but the actual "point" on its surface which presents, and, if it be wished to express this correctly, we do not know of a more accurate definition of the term than that given by Professor Hodge, of Philadelphia, who describes it as "that portion of the foetal ellipse which is recognized toward the centre of the canal of the pelvis and vagina." This is practically the same as that of Dr. Matthews Duncan—"that point on the surface of the child's head through which the axis of the developed pelvic canal passes." But while admitting these to be mathematically more correct, we must own to a preference for the meaning which is attached to the word by Dr. Tyler Smith, who defines it as "that portion of the foetal head felt most prominently within the circle of the os uteri, the vagina, and the ostium vaginæ, in the successive stages of labor." When the dilatation of the os uteri proceeds with unusual slowness, owing to rigidity, or premature rupture of the membranes,

mines a motion which is the resultant of this and the force from above, and, being intermediate in its direction between these, is consequently downwards and forwards. Solayrés calls this a *reflected* force, and describes the mechanism in the following graphic terms: "Hujus motûs rationem haud immerito contuleris cum eâ, quæ nucleus prementes digitos fugit." An illustration of this is familiar to every schoolboy who has propelled a cherry-stone fresh from the fruit by pressing it between his fingers.

As the forehead of the child has, in its course along the back part of the cavity, to traverse a curve which is of much greater extent than the posterior surface of the pubis, we would anticipate what actually does take place,—viz., that the chin, before the completion of the movement of rotation, leaves the breast, and that the anterior pole of the occipito-frontal diameter descends, as regards the brim-plane, considerably in advance of the other,—this motion being again reversed, at a more advanced stage, as we shall see presently. The successive changes which thus occur in the obliquity of the long diameter are well expressed by Dr. Murphy, when he says that the head may, in the course of labor be described as "oscillating on its transverse measurement."

From the time at which the head comes under the influence of the reflected force of Solayrés, its general direction is altered, and now corresponds pretty closely with the axis of the vagina. The vagina, or what, in its altered anatomical relations, we may more appropriately call the lower portion of the parturient canal, has a curve for its axis, which we have already demonstrated (p. 42) as continuous with the axis of the bony pelvis. The general direction of this is downwards and forwards, so that the head may be assumed now to move in a direction which forms an approach to a right angle with its original course. The pressure of the head upon the perineum gradually effects the dilatation of the terminal portion of the canal. The left division of the os frontis, in the immediate vicinity of the fontanelle, or the contiguous portion of the parietal bone, presses upon the coccyx, which moves backwards to the extent of an inch, in order to permit of the passage of the child. If the pelvis is at all under the average in point of size, the frontal region is arrested at the apex of the sacrum, and the occipital end of the lever is again driven downwards, so as to press upon and distend the perineum. If, however, the parts be ample, and the perineum not unduly resistant, this does not occur, and the whole bulk of the head follows the curve of the sacrum at every pain, obviously attempting to effect an exit immediately under the pubic arch.

From the above descriptions it is apparent that the occipito-mental or longest diameter of the child's head is never at any time thrown across the pelvis. Indeed, if the flexion of the head is great, Dr. Hodge is not far from correct when he describes it as coinciding with the axis of the brim. The moment now approaches, however, at which a new movement must be executed, that of extension, and it is difficult at first to see how this can be effected without the extreme diameter being turned into the conjugate of the outlet. Nature fortunately does

the breech occupy the left or opposite oblique diameter to that in which the antero-posterior measurement of the head is descending. Upon the birth of the head, the shoulders encounter the same difficulty from the ischial spines; and, as the rotation must be such as to bring the anterior shoulder, as it did the occiput, under the pubic arch, the left or posterior shoulder revolves into the hollow of the sacrum. This movement of the shoulders takes place, therefore, in a direction which is the reverse of the previous rotation of the head; so that we may, with perfect propriety, look upon the head as resuming the oblique position which it originally held in reference to the pelvis. It has, on this account, been well called the movement of Restitution. There is

FIG. 103.

FIG. 105.

The head approaching the outlet.
First position.

First position as seen from above.

another phenomenon which should not here be overlooked, inasmuch as it exercises no inconsiderable influence on the progress of labor. This is the moulding of which the head is susceptible, without any risk to the child. The amount of moulding is, of course, proportionate in a great measure to the resistance, but the head, when born, presents, in every instance, a shape which gives it a peculiar, elongated appearance, and, in cases where the caput succedaneum is much developed, this is still further exaggerated. The moulding and pointing of the occipital region is the *Hinterhauptspitze* of the Germans; and the form presented is, as will be shown in the sequel, very different from that which is produced in occipito-posterior positions. As soon as the shoulders have escaped, the mechanical difficulties of delivery may be said to have terminated; for the extent to which the parts have been dilated during the birth of the head, will have rendered them more

than sufficient for the egress of the parts which remain. The Placenta escapes edgewise, folded, as formerly described, and not inverted, as is usually asserted.

We have, in the above description of the first position, gone pretty fully into detail, in order that the other three positions may be more easily understood. We would recommend the student, before attempting any practical investigation of the facts which have been set forth, to follow the description with the bones in his hand—by which means only can he thoroughly understand the subject, to the extent which is essential as a preliminary to the intelligent examination of the phenomena of actual labor.

The figure here shown indicates, diagrammatically, the various positions which the child occupies during the successive stages of labor, as

FIG. 107.

Diagrammatic representation of successive stages of the first position.

just described. The representation is supposed to be of a woman from whose body the right half has been removed, leaving the fetus alone untouched.

Second Position.—This is the converse of the First. As the head enters the brim of the pelvis, the occiput is turned towards the right ilio-pectineal eminence, the forehead being directed to the left sacro-iliac synchondrosis. This, therefore, like the first, is an occipito-anterior position, the only difference being that it occupies the left oblique diameter instead of the right. It is the left side of the head which presents, and the neighborhood of the left parietal protuberance is, therefore, the part which the finger first reaches in a digital examination. The sagittal suture corresponds to the left oblique diameter, so that when the woman

by the head. As the result of this is to restore the head, by a movement on its perpendicular axis, to its original position, it has been called the movement of Restitution.

CHAPTER XVIII.

MECHANISM OF LABOR—(CONTINUED).

OCCIPITO-POSTERIOR POSITIONS—THE THIRD POSITION; ROTATES INTO THE SECOND, OR MAY TERMINATE WITH FOREHEAD FORWARDS—THE FOURTH POSITION; ROTATES INTO THE FIRST, OR MAY TERMINATE WITH FOREHEAD FORWARDS—ARTIFICIAL RECTIFICATION OF THESE POSITIONS—COMPARATIVE FREQUENCY OF THE FOUR CRANIAL POSITIONS. FACE PRESENTATION—DISTINCTION BETWEEN "OBSTETRICAL" AND "ANATOMICAL" FACE—MENTO-POSTERIOR AND MENTO-ANTERIOR VARIETIES—FOURTH POSITION: MECHANISM OF—THIRD POSITION—FIRST POSITION; ROTATES INTO THE FOURTH—SECOND POSITION; ROTATES INTO THE THIRD—RELATIVE FREQUENCY OF FACIAL POSITIONS—OPERATIVE INTERFERENCE IN CASES OF FACIAL POSITION—IRREGULAR POSITIONS—TABULAR COMPARISON OF CRANIAL AND FACIAL POSITIONS.

IN the two remaining, or Occipito-Posterior positions, the head lies as in the former, in one or other of the oblique diameters, so soon as it fully occupies the brim. The reversed position, however, of the frontal and occipital poles of the long diameter of the head here renders necessary the application of mechanical principles, which in some respects differ very widely from those which have been explained as accounting for the phenomena attendant upon delivery in the occipito-anterior position. This becomes to some extent obvious upon an examination of the cranium itself, and by a comparison of the broad, unyielding forehead with the pointed, compressible occiput. But if we observe further the relaxation which the pelvic cavity bears to possible movements of flexion and rotation, it will at once become apparent that in these positions nature has difficulties to overcome in comparison with which those attending the occipito-anterior positions are probably trifling. What these special difficulties are, we shall attempt to show, noting carefully, at the same time, the means which nature adopts to overcome the impediments which thus arise.

Third Position.—The head in this case enters the brim of the pelvis in the right oblique diameter, with the forehead turned towards the left ilio-pectineal eminence and the occiput to the right sacro-iliac synchondrosis, as shown in the accompanying figure. On a digital examination, it is the left parietal bone which the finger touches in the neighborhood of its protuberance, at a point usually a little anterior to that reached in the second occipito-anterior position. With reference to the posture of the woman, the sagittal suture is traced downwards and forwards, where it ends in the large lozenge-shaped anterior fon-

the occiput and corresponding recession of the forehead are still the signs which point towards rotation. For, in this situation, the forehead, which occupies the anterior inclined plane of the ischium on the left side, cannot, on account of the approximation of the ischial spines, rotate directly in the same pelvic plane. It is essential, therefore, that the forehead should be elevated above the spine of the ischium, and the antero-posterior diameter of the head thus shortened in reference to the pelvic planes. This is precisely what is effected by flexion at this stage; and if we watch the process with the finger, we observe, in the first instance, that the anterior fontanelle recedes from our finger in the direction of the horizontal ramus of the pubis. The posterior fontanelle descends and comes within easy reach, until the flexion is so complete that the occipito-mental diameter approaches the axis of the brim. A rotatory or screw motion of the head now becomes manifest, the forehead moving upwards and backwards on the left, and the occiput downwards and forwards on the right side of the pelvis during a pain; and the head resuming its former position during the interval. Presently, and often in the course of a single pain, it performs a rotation equal in extent to the quadrant of a circle; and if we now make an examination, we find that the head occupies what was described in the last chapter as the second cranial position. In its normal and natural course, therefore, *the third position rotates into the second.*

The rotation thus effected is remarkable not only in regard to the extent, but also in respect of the mechanism by which it is effected. If the mechanism were identical with what obtains in occipito-anterior positions, the forehead would, in every case, be directed by the ischial spine over the left ischio-pubic ramus towards the subpubic arch. But the mechanical result of pressure transmitted through the vertebral column is the same in all cases where the pelvic resistance is equal on all sides. The occiput being thus pressed down, the forehead rises as has been described, and the chin is approximated to the sternum. A point is presently reached at which the whole forehead has risen above the level of the ischial spine, and the rotatory movement commences. The occiput, on the other side, is beneath the right spine, and approaches the centre of the pelvis, being directed downwards and forwards, on the right side, by the corresponding margin of the sacrum and coccyx, and the sacro-sciatic ligaments. This is probably the cause of the first effort at rotation, but as soon as the forehead passes sufficiently far back to impinge upon the posterior ischial plane, it at once glides along this to the sacro-iliac synchondrosis, and the rotation is complete. Afterwards, the presenting point being as before a portion of the left parietal bone, the case goes on as if it had been from the first a second position, the only difference as affecting the progress of the labor being that that process has now to commence,—should it be required,—which consists in moulding of the parts, and which, under other circumstances, would already have been in some measure effected. From what has been said, it will be understood that the earlier and the more easy is the descent of the occiput, the more uninterrupted and satisfactory is the course of the labor: in such cases there is, in fact, no special difficulty, and no additional danger either to mother or child. But, in cases in which

appearance, owing to the flattening of the occipital, and bulging of the frontal regions.

The comparative difficulty which arises from the situation of the rectum constitutes, therefore, as it would seem, the only practical distinction between third and fourth positions. All observers seem to have agreed in this—that, in the fourth, the rotation takes place as a rule, and probably, on account of this very difficulty, on a higher level as regards the pelvis; and that, if it descends to the floor of the pelvis with the forehead still directed towards the right obturator foramen, the chances of rotation at this more advanced stage are less than in the third. Rotation, at an early stage of labor, before it is yet practicable to ascertain the actual position of the head with anything like certainty, is probably of much more frequent occurrence than we have any idea of. Few things are more familiar to the experienced accoucheur than a rotatory or rolling movement of the head, which he observes either during a pain or an interval, while it is still high in the pelvis. This is due partly to uterine action, and partly to the movements of the fetus, and we have no doubt that, by this means, many unnatural and faulty positions are rectified even after labor has commenced; and we are further entitled to assume that in this way many occipito-posterior positions are rectified at such a stage that their detection is rendered impossible. It should always be remembered that the dorso or occipito-anterior position of the child is the natural one, and that according to which the irregular oval which it forms is most conveniently disposed.

Recognizing, as we now do, the natural termination of third and fourth cases as second and first respectively, a very important practical point arises, which may perhaps be most conveniently discussed at this place. This is the possibility of rectification by artificial means of occipito-posterior positions, which are about to terminate, or threaten to terminate, with the forehead towards the pubis. No possible doubt can exist as to the fact that the position of the head may be, and often has been changed by the operations of the accoucheur. In confirmation of this assertion, we have the evidence of the most eminent obstetricians. More than a century ago, Smellie, after having repeatedly but in vain attempted to drag the head through in a case of this kind, bethought him of trying to turn the face backwards into the hollow of the sacrum. Success attended his first attempt—a result which “gave him great joy,” and opened his eyes to a new field of improvement “in the method of using the forceps in this position.” Clarke, Burns, and others, stated that rectification could be brought about in many cases by the use of the finger alone. Among accoucheurs of our own day, Drs. Murphy and West have emphatically expressed their views in favor of the feasibility of this proceeding.

As regards the period of labor at which rectification may be effected, we find that many writers assume, or at least imply, that the operation may be performed at any stage. The fact is, however, that the head cannot in ordinary circumstances be rotated until it has reached that stage of the labor where nature as a rule spontaneously induces the rotation, so that it will often be a matter of difficulty to say what share

The accidental position, for example, of the head in the conjugate or transverse diameters of the brim has, in the opinion of many approved authorities, warranted them in adding four more, making eight positions in all. We apprehend, however, that the mechanism, in such rare instances as may be met with of conjugate or transverse as primary positions, does not call for any special description, and that to admit them would be unnecessarily to complicate a subject already beset with sufficient difficulties. Both of the positions indicated would, in a normal pelvis, inevitably be resolved into one or other of those which have been described, and would thus terminate according to the laws which we have attempted to elucidate; while, if they were the result of abnormal disproportion of the parts, they would come under the influence of special laws, which it is no part of our object at present to explain. We take no notice, it will be observed, of premature birth or putridity of the fœtus, in which the child *may* pass in any diameter; but even here the tendency is to follow the natural course.

We have now to consider the subject of the Comparative Frequency of the cranial positions. It may be considered that this ought to have been referred to at a somewhat earlier stage. We have, however, purposely postponed it until now, as considerations arise, in reference to points not yet fully determined, which can only be understood by those who are in possession of the facts which have been detailed in this and the preceding chapter. It is to be regretted that no inconsiderable differences of opinion, on many of the points referred to, have arisen in consequence of the views of Naegele having been implicitly received, while yet they obviously lacked confirmation.

From the time of Smellie, the first position has been universally admitted as that which is by far the most frequent. Until the publication of Naegele's celebrated essay, there was a similar unanimity among obstetricians as to the second position being next in point of frequency to, and in all respects the converse of the first; but the effect of his researches upon the minds of all modern practitioners has been to modify greatly, and in most cases entirely to overthrow, the conclusions of his predecessors on this point. In order to avoid a mass of statistical details, we shall only attempt here to compare the conclusions of Naegele, and of those who agree with him, with the results attained by many modern observers who differ from him more or less widely. It is beyond doubt that his original doctrines are, to the present day, more fully believed in this country than in France, America, or even in Germany; and this is obviously due to the fact that many of our most eminent accoucheurs have taught and still teach these doctrines, while some believe that they have confirmed their accuracy by subsequent research. All this is shown in the following tabular analysis; but it is therein further made evident that there are many men of undoubted talent and experience who decline to accept the evidence even of Naegele as of greater weight than that of their own senses. The following table shows the percentage of each of the four cranial positions, as deduced from the published statistics of the observers quoted:

an accoucheur as Dr. Murphy, should be held as more likely to be correct than when the observations on which statistics are founded are intrusted in a great measure to others. The experience of Dr. Swayne shows a larger number of cases of first position than any other observer, and in other respects his deductions are still more strikingly opposed to the idea generally received. Reverting to the opinion held before Naegele, he believes that in point of frequency the second comes after the first, and that the fourth is more frequent than the third, an opinion in which he is supported by Professor Millar of Louisville. In the table above given we have avoided extremes, or we could have given statistics which have been offered in proof of assertions which are, as regards the views of Naegele, more contradictory still.

In attempting to reconcile statements so conflicting as these, we cannot fail to become convinced of the fact that, even in the most experienced hands, it is no easy matter to determine the position of the head in the early stage of labor. It is not to be conceived that all the observers above quoted can be right. It is equally clear that nature must have some law, according to which the head of the child enters and passes through the pelvis of the mother. But is it in our power to determine what is this law of nature, and in what this or that observer has erred? Can we so reduce the law to statistical results, as to place the matter forever on the basis of irrefragable evidence? He would be a bold man who, in the present state of the art, would venture to answer these queries in the affirmative. For our part, we are convinced that there is ample room for renewed observation and research; but, unless a man can bring to bear upon the subject a mind unwarped by prejudice or preconceived ideas, his testimony will be of little avail. Take, by way of example of this, the second position. Who has not been summoned, again and again, to the bedside of a woman in labor, to find the head in the lower third of the pelvis, and in the position in question? In such a case, the disciple of Naegele would probably record in his note-book, "A case of third position, in which rotation had occurred before my arrival." He is driven to this conclusion if he adopts Naegele's theory, but yet, as regards the individual case, the evidence is Naegele's and not his. Or, again, if quite early in labor he finds the head undoubtedly in the second position, he classifies it as irregular, and assumes the presence of some of the "various circumstances" in which only, says Naegele, this position can occur. To be candid, however, we must admit of the possibility of a mistake which is the converse of this, and which would be committed by him who should rank every case as second, without any reference to the stage at which the first examination is made. It must, we think, be manifest that correct conclusions on this subject can only be based upon a large number of observations, in which the position of the head is ascertained, in every case, at the beginning of the labor, or before it experiences any pelvic resistance further than that which is due to gravity.

Granting that the first position is by far the most frequent, occurring, as it does, in about 70 per cent. of all cranial presentations; and, granting further, as we do, that Naegele's discovery—that the third is, as a primary position, next to the first in point of frequency—is correct, we

well understood, but the initiatory movement which results in the position can only be, as is obvious, a movement of extension, which, at an early stage of labor, or prior to its occurrence, is substituted for the usual movement of flexion occurring during labor in the ordinary positions of the cephalic extremity. In other words, and to take the most simple view of the matter, cranial are converted into facial positions by a simple movement of the head on its transverse axis. As, in this and other respects, there is a very close analogy between the mechanism of face and vertex presentations, we introduce the subject of the former at this place from a conviction that it will be much more easily understood if studied along with the ordinary cranial positions.

In pursuing the analogy which exists between the face and the vertex, we note, in the first place, that the "obstetrical" differs from the "anatomical" face in including the forehead. The long diameter of the face, therefore, which extends from the centre of the forehead between the frontal protuberances to the tip of the chin, corresponds to the occipito-frontal diameter; and, in like manner, the transverse diameter, from one malar bone to the other, corresponds to the biparietal measurement of the cranium. We observe, further, in looking closely at the facial oval, that the pointed chin represents the occiput, while the forehead is, in each position, the broad end of the long diameter. A premature and exaggerated movement of extension of the head having thus, as we conjecture, converted a cranial into a facial position, we find that in its descent and birth, it follows the same mechanical laws as those which govern the vertex. Movements are thus executed, which in every stage correspond to those already described, with this important distinction, that the relation which they bear to the trunk of the child is in some respects reversed. This will become apparent as we proceed. The face like the head, and for similar reasons, descends into the pelvis with its long diameter in one or other of the oblique diameters of the brim. There are thus four positions in which we may find the face, according as the presentation may have been originally a cranial position of the corresponding number. It will be observed, however, as a most important distinction, that the numbers of the Mento-Anterior variety do not correspond to the occipito-anterior of the cranium. Each presentation as numbered is, we repeat, supposed to be produced from the corresponding cranial position, by a simple movement on its transverse axis.

MENTO-POSTERIOR,	{	<i>First Position,</i>	{ Face in Right Oblique Diameter; forehead forwards.
		<i>Second Position,</i>	{ Face in Left Oblique Diameter; forehead forwards.
MENTO-ANTERIOR,	{	<i>Third Position,</i>	{ Face in Right Oblique Diameter; forehead backwards.
		<i>Fourth Position,</i>	{ Face in Left Oblique Diameter; forehead backwards.

The chin, in all these positions, being looked upon as the mechanical equivalent of the occiput, it follows that the Mento-Anterior position, in which the front of the child is turned forwards, is the natural termination of all face cases. This, indeed, is the case in a much stricter

sible the analogy subsisting between facial and cranial cases, we observe that the Mento-Posterior positions correspond closely with the fourth and third cranial. As in the mento-anterior variety, we may accept the chin as representing the occiput. The First Facial Position is produced from the first of the head, by a movement of extension. Its long diameter corresponds, therefore, to the right oblique diameter of the pelvis, the chin being directed to the right sacro-iliac synchondrosis, and the centre of the forehead towards the left ilio-pectineal eminence. The chin thus occupies the position where the occiput lies in a third cranial position. The part which is lowest in the pelvis, and which the finger feels from the vagina through the anterior walls of the uterus, is the right malar bone. If the os is sufficiently dilated, we may feel through it the bridge of the nose. Carrying the finger, in reference to the position which the woman occupies, downwards and forwards, we may reach the forehead, the frontal suture indicating the path from the bridge of the nose to the anterior fontanelle; while, by passing it in the opposite direction, upwards and backwards, we may feel the ridge of the nose, and the mouth, where the alveolar ridge may be distinguished, and ultimately reach the chin. Should the resistance of the os, at this stage, be such as to cause the development of a caput succedaneum, it will be found to occupy the upper half of the right side of the face, and will generally, to some extent, involve the eye.

With regard to this position, the same observations may be made as in regard to the third of the cranium,—that it *may* terminate in two ways: with the chin towards the hollow of the sacrum; or, by a rotation forwards, which, by bringing the chin upon the right anterior ischial plane, converts it into the fourth position, already fully described. Although Smellie, and many writers of merit since him, describe cases of facial presentation in which the chin passes into the hollow of the sacrum, and is born over the perineum, it is only with difficulty that we can admit,—for reasons which will be detailed afterwards—a bare possibility of such a termination of labor by the natural efforts. The head, therefore, adopts a course very similar to what obtains in third cases of the cranium. As in the one case the occiput, so in the other the chin descends, prior to rotation, somewhat in advance of the forehead. The fronto-mental diameter being, however, more than an inch less than the occipito-frontal, the same degree of obliquity is not necessary as an essential preliminary to rotation. And it is fortunate that it is so, for the head is already so strongly extended that a further extension seems all but impossible. In the course of the rotation, the chin comes out in front of the right ischial spine, while the forehead moves upwards and backwards towards the left sacro-iliac synchondrosis, and the case is thus converted into what we have already described as the fourth position of the face. The rotation, therefore, which converts the first facial into the fourth is, if we read “chin” for “occiput,” essentially the same as occurs when the third of the vertex rotates into the second. Less obliquity of the long diameter of the face being required, the rotation of the face takes place with greater ease, which is another reason why we should look upon this as the only natural termination of that position of the face which is the result pri-

For, the more closely we look at the relation which the one presentation bears to the other, the more obvious does it become that the chin is mechanically the analogue of the occiput, and that, therefore, the anterior surface of the foetus is turned forwards in all face cases which are to be regarded as normal. In cranial positions, on the contrary, the back is, as a rule, turned forwards. This, while it so far destroys the analogy between the two classes of cases, establishes between them more important practical points of resemblance; for, as our object is, in any assistance which we may consider ourselves justified in offering, to bring the occiput forward under the pubic arch in cranial positions, so in these also we use what means we can, with the view of aiding in a similar way the descent and precedence of the chin. The aphorism of Roederer might, in fact, if we substitute the word "mentum" for "occiput" be admitted as the leading principle upon which nature conducts all such labors. "Indifferens est quisnam sit capitis positio, modo pars conica atque arctissima, *mentum* nempe, descendat."

In point of relative frequency, therefore, we must speak with some caution. No doubt can exist with reference to the fact that the third and fourth, or mento-anterior, positions are the natural terminations of all face cases. In what proportion of these, third and fourth positions of the cranium have become directly transformed, as we have conjectured, into the corresponding facial positions, it is, and probably from the rarity of the cases always will be impossible to determine. That such a transformation is possible, no one can deny; that it is probable, we will venture to assert. And, moreover, should it so occur, the change of a fronto-anterior position of the cranium into a mento-anterior of the face must be looked upon as a much more favorable termination of a labor, than the tedious process already described which, in a certain proportion of such cases, brings the occiput over the fourchette before the face can pass from under the pubis. It is on this ground, indeed, that we have considered ourselves justified in taking note of these as distinct positions, and not merely as stages in the course of the other two.

If we take into consideration, however, the enormous preponderance of cases in which the cranium or vertex presents with the forehead backwards, we readily admit that it is much more than probable that the mento-posterior positions are, in the earlier stages of labor, the usual positions of the face. The fact again that the first position of the cranium occurs in nearly 70 per cent. of the four varieties of these cases, suffices to account, on the principle of rotation, for the preponderance at the moment of delivery of fourth over third facial positions. But the fact recorded by Naegele, that the preponderance alluded to amounts only to twenty-two fourth, as against seventeen third, facial positions, can only be accepted as confirmatory of his statements as to the frequency of the various vertex presentations, by supposing that the third position of the cranium is, as we have assumed, not unfrequently converted by simple extension into the corresponding position of the face. Otherwise, the disproportion would be much greater between the two mento-anterior terminations than he assumes.

That mento-posterior positions may terminate as such in a large

other similar modes of procedure were at once thrown aside when the fundamental errors from which they sprang were removed by the industry and genius of Naegele.

In face presentations, as they occur in actual practice, we believe the safest rule for our guidance is to avoid interference as far as possible. In occipito-posterior positions of the cranium, we have recommended interference in such cases only as threaten to terminate with the forehead in advance, and the same rule should guide us in our management of the face. When the chin is originally forwards, or has already rotated, no interference whatever is required. It is usually recommended, however, in the mento-posterior positions, to aid the rotation, either by hooking the finger into the mouth, and making cautious traction in the proper direction, or by some other mode of manual interference, with the view of bringing the chin towards the pubic arch, as the face is about to emerge from the pelvis. It is doubtful, however, whether such interference should be sanctioned as the proper routine procedure. So many delicate points have here to be attended to—the direction of the pressure, the time for operation, and the like—that we incline to the belief that nature should, in the great majority of instances, be trusted to. For, if the practitioner of average experience can have but a few cases to observe in the course of a lifetime, it is scarcely to be expected that he can attain such special skill as to act with unfailing precision. We should, therefore, in any such case as may come under our notice, carefully watch the process which nature is adopting, and act only in such instances as she may seem to be calling for assistance.

It may be necessary, in facial as well as in cranial positions, to give assistance by manual or operative interference in cases in which delivery is delayed, although the parts are normally situated. Such aid as, under the circumstances, it may seem necessary to afford, is to be employed in each case on the same principles. The only points which are here to be remembered as distinctive, arise from the facts—that in facial positions the vessels of the neck are, in consequence of the peculiar position, subjected to very unusual pressure, and that the adjacent maternal organs are also likely to be compressed by the manner in which the child's head is doubled back. Both of these conditions should lead us, therefore, to watch the progress of such a case somewhat more strictly than usual, in order, if possible, to detect the earliest indications of abnormal obstruction to delivery, and so soon as this may arise, to relieve it without delay. The forceps, for example, may be employed in such cases, at a period somewhat earlier than is considered necessary in cranial positions, in proportion exactly to the imminence of the danger which we apprehend. Should it, however, occur that the head descends to the floor of the pelvis, and yet no effort is made in the way of rotation, it will be proper to aid the movement in question, having first carefully ascertained the position of the face, and calculated the direction in which our efforts should be applied. Persistent mento-posterior cases may possibly, as has already been said, terminate as such, if the child be premature or putrid, or the pelvis of unusual capacity; but if, owing to the disproportion of parts, or some other special cause, rotation should not be effected, the inevitable result is such obstruction

In Cranial Positions, therefore, *the third rotates into the second, and the fourth into the first*; while in Facial, *the second rotates into the third, and the first into the fourth.*

CHAPTER XIX.

PELVIC PRESENTATIONS.

THE PRACTICE OF THE PAST—THE PELVIS A NATURAL PRESENTATION—DORSO-ANTERIOR AND DORSO-POSTERIOR POSITIONS—BREECH PRESENTATION; FOUR POSITIONS OF—FIRST POSITION OF THE BREECH: ROTATION: PASSAGE OF THE BUTTOCKS: DESCENT AND BIRTH OF THE SHOULDERS: DIFFICULT PROGRESS OF THE HEAD, AND MECHANISM OF ITS EXPULSION—SECOND POSITION OF THE BREECH—THIRD POSITION OF THE BREECH: BIRTH OF THE LOWER PORTION OF THE TRUNK, AND OF THE SHOULDERS: ROTATION OF THE FACE BACKWARDS, AND MECHANISM OF THE BIRTH OF THE HEAD: EXCEPTIONAL TERMINATIONS—FOURTH POSITION OF THE BREECH—SPECIAL RISK OF PELVIC PRESENTATIONS—DIAGNOSIS AND PECULIARITIES—KNEE AND FOOTLING CASES—MANAGEMENT OF PELVIC PRESENTATIONS—NATURE OF ASSISTANCE TO BE RENDERED—USE OF THE FILLET, VECTIS, AND BLUNT HOOK—INDISCRIMINATE DRAGGING ON THE LOWER LIMBS TO BE AVOIDED—TREATMENT OF CASE WHERE ARMS PASS UP ALONGSIDE HEAD—MANAGEMENT OF THE FUNIS—INDICATIONS OF IMPENDING DEATH OF THE CHILD—MANIPULATION FOR EFFECTING SPEEDY DELIVERY OF THE HEAD—USE OF THE FORCEPS.

ALTHOUGH the writer of the obstetrical memoranda which were attributed to Hippocrates recognized the oval position of the child in the womb, and illustrated the impossibility of delivery in cross birth by the graphic simile of the olive in the neck of an oil jar, he, strangely enough, as has already been mentioned, omitted to perceive the full force of his illustration. For, as every oval has two ends, he ought to have concluded that the foetal oval could pass naturally with either of these in advance, as the olive might be extracted from the jar. Failing to observe this, however, the ancients believed that presentations of the pelvic extremity were abnormal, and should in all cases be rectified by artificial aid. The result of such a mode of practice as this points to—which obtained throughout a period of several centuries—is looked at by the modern obstetrician with horror, on account of the fearful sacrifice of human life which such a procedure must have involved. There is nothing, indeed, in the history of Midwifery comparable to this; and the idea of turning by the head in all cases of pelvic presentation is one so repugnant to every principle of the science and art of obstetrics, that it is difficult to conceive by what perversion of reason a blunder so fearful could have been perpetrated. Certain it is that, until the revival of anatomy by Vesalius, and even for some time after the art of printing had been discovered, the practice recommended in pelvic pre-

DORSO-ANTERIOR,	{	<i>First Position,</i>	{ Breech in Left Oblique Diameter; left trochanter forwards.
		<i>Second Position,</i>	{ Breech in Right Oblique Diameter; right trochanter forwards.
DORSO-POSTERIOR,	{	<i>Third Position,</i>	{ Breech in Left Oblique Diameter; right trochanter forwards.
		<i>Fourth Position,</i>	{ Breech in Right Oblique Diameter; left trochanter forwards.

The breech is recognized, on a digital examination, by the ischial tuberosities, between which the genital organs, male or female, may be distinguished. As the parts are, however, frequently much distorted by the formation of the caput succedaneum, it is not always so easy for the beginner to recognize the position as he may perhaps imagine. He may, in a hurried and imperfect examination, very readily mistake the tuber ischii, which his finger first touches, for the prominence of the shoulder, and the female genital organs for the fold of the axilla. It is well, therefore, that in every case he should make a leisurely examination, in order to insure the accuracy of his diagnosis. The genitals, occupying a situation between two osseous prominences, one of which is usually considerably lower than the other, can scarcely be taken for anything but the breech; and, in the case of the male, the scrotum is generally tumefied. But, if any doubt should arise, this is set at rest if, in addition to the parts named, he recognize the anus, the point of the coccyx, and the unequal osseous surface of the back of the sacrum. To this last point Cazeaux attaches considerable importance. At the commencement of labor, or even before it has come on, it may be possible to recognize these positions by palpation of the abdominal tumor, which, when the walls of the belly are thin and relaxed, enables us to recognize the general outline of the child, with the rounded resistant cephalic extremity turned towards the fundus and inclined a little to either side. The pulsations of the foetal heart are heard on a somewhat higher level, near the umbilicus. The absence in the vagina of the firm and smooth globular head, which generally occupies the lower segment of the uterus, would further corroborate such observations as the above. The presentation is, at this stage, higher than usual, and often beyond the reach of the finger; but, in knee and footling cases, the knees or heel may be felt lying against the most dependent part, and retreating before the pressure of the finger. In its general shape and external appearance, the uterus is not sensibly altered.

Presentation of the pelvic extremity is by no means a rare occurrence, as it is met with once in about 45 mature births; and, in premature delivery, it is, for reasons formerly stated, much more frequent. In 80 cases observed by Dubois, 54 were ordinary breech positions, and in 26 the feet descended in advance. Madame Lachapelle only saw the knees presenting once in 3445 instances of labor, and in the statistics of the Lying-in Hospitals of Würzburg and Prague, we find but one case in 9274. The breech is, however, not only the most frequent but the most favorable of the pelvic presentations. For, although at first sight it might appear that a footling or knee position might, on the principle of the wedge, be a more favorable arrangement mechanically, an observation of the whole process at once shows that

this moment, increases the risk, is the failure of expulsive force. This does not imply so much a failure of expulsive action as that, the uterus being now nearly empty, its propulsive energy is brought to bear upon the head at great mechanical disadvantage; and it is difficult to see how, but for the contraction of the vagina, and of the muscles at the floor of the pelvis, nature could ever complete a case of pelvic labor. In the position which we have at present under consideration, the head descends with the forehead turned towards the right sacro-iliac synchondrosis, and a little in advance. The occiput is turned towards the left ilio-pectineal eminence, and after rotating towards the subpubic arch, is there arrested until the chin, face, forehead, and vertex sweep successively forwards and upwards over the distended perineum. Fig. 118 shows

FIG. 118.

Birth of the head.

the head in this position immediately prior to the final act which terminates the second stage of labor.

Second Position of the Breech.—In this, the position is also dorso-anterior; but, instead of occupying the left, as in the position above described, the pelvis descends in the right oblique diameter. It is therefore the right ischial tuberosity which presents, and the right buttock which descends in advance as far as the pubic arch, being directed towards it by the anterior inclined plane on the left side of the pelvis. The left hip sweeps over the perineum, and the shoulders descending in the right, and the head in the left oblique diameters, are successively expelled by a mechanism which is in all respects identical with that which obtains in the first position, only in the contrary direction as regards the various rotatory and other movements. At first it seems strange that this should be less frequent than the first position, and that nature should prefer the left oblique diameter in breech cases to the right; and this too would almost seem to throw doubt upon the opinion

we have expressed that she prefers the right oblique in cranial presentations, in order to avoid the left, which is encroached upon by the rectum. But, even here, if we watch the case to a termination, we find nature apparently guided in a majority of cases by the selfsame law. For, as we have already seen, the really critical and important moment of a breech case is that during which the head passes through and out of the pelvis; and it is on this account that in the more common first position the head is in the favorable diameter; whereas, in the second, the head descends in the left, which is thus, as statistics would seem to show, more dangerous to the child, as the detention of the head is more likely to occur.

Third Position of the Breech.—Of 161 cases occurring at Heidelberg, 121 presented with the back, and 40 with the belly of the child turned forwards. This gives, as nearly as possible, a preponderance in favor of the two first positions, already set down at three to one. The two Dorso-Posterior positions, then, are of comparatively rare occurrence.

In the Third Position, which occurs less frequently than any of the others, the breech lies in the left oblique diameter, which, as the back is turned towards the vertebral column of the mother, brings the right tuber ischii to the front, and deeper in the pelvic cavity. When it reaches the floor of the pelvis, the corresponding buttock glides along the right ischial plane, and attains the summit of the pubic arch, where it is arrested until the left ischium sweeps over the perineum, when the belly of the child is born towards the mother's left thigh. The shoulders descend in the same oblique diameter, and are expelled pretty much as in the dorso-anterior position. The head then enters the pelvis in the right oblique diameter, with the occiput towards the right sacro-iliac synchondrosis. In the great majority of cases, the termination of this position is by a rotation which brings the occiput from the sacro-iliac synchondrosis to the obturator foramen on the right side, and the forehead from the obturator foramen to the sacro-iliac synchondrosis on the left side. In a word, the rotation is the same which converts a third into a second position of the cranium. This rotatory movement has, in some cases, been observed to take place at an earlier period in the labor. When that occurs, the movement takes its direction from the original rotation, which brings the right buttock in advance. It passes then, from right to left, into the conjugate, and a little beyond it, and ultimately continues the movement in the same spiral direction, until the belly of the child looks almost directly backwards. The trunk, in this case, participates in the rotation of the breech; but if it does not so participate, the head itself, when subjected to the resistance of the pelvis, performs the extensive rotation which we have described. Whatever may be the course of labor in this position, the natural termination is a rotation into the second position. The head, therefore, whether the vertex or the breech presents, rotates, as a rule, *from the third position into the second.*

Cases are occasionally observed in which the rotation above described does not take place, and the head comes into the world with the occiput turned backwards. The usual course in such a case is, that the head descends in the pelvis in a strong state of flexion, with the forehead

All presentations of the breech tend, therefore, as has been shown, to terminate more irregularly than those of the head. The birth of the nates is attended with even less difficulty than when the head precedes, but the real difficulty of the case is the speedy and safe passage of the latter. And it is indeed remarkable, not only in regard to the first position, but also the fourth or more frequent of the dorso-posterior positions, that the head, in its descent by the normal path, avoids that oblique diameter which is contracted by the rectum. But whether this occurs or not, all pelvic presentations are attended by special and greatly increased risk. This is much more so, however, in regard to knee and footling cases, than when the breech presents in the ordinary way. This is brought out very clearly by the statistics of 71,578 cases collected by Dr. Rigby from various sources. The nates presented once in every 78 cases, and the feet once in 108.5: of the nates cases the child was born dead in the proportion of 1 to 3.8, and in the footling births 1 to 2.8. Knee presentations are so rare that they need not be taken into consideration.

Something must here be said in reference to the diagnosis of knee and footling cases, but as regards the mechanism, according to which labor under such circumstances is accomplished, no special description is necessary, as it differs in no material respect from what has been described in regard to the breech. The mechanism of all pelvic presentations is, in other words, essentially the same. Very little in these, as in pelvic presentations generally, can be recognized with certainty, until the rupture of the membranes enables us to distinguish the various parts. The form of the bag of waters, upon which some have laid great weight in a diagnostic point of view, may certainly give rise to suspicion, although it can never by itself be of much importance. In all pelvic presentations it is, as a rule, more pointed, and projects further into the vagina. In footling cases, the bag is long and sausage-shaped, and through it the foot or feet may be felt. When the membranes ultimately give way, the discharge of the liquor amnii does not take place with such a gush as in cranial positions, but on the other hand it is more continuous, and the drainage more complete. The head, acting like a ball-valve, hinders the liquor amnii from escaping, except in small quantities, in the intervals between the pains; but the irregular pelvic extremity admits of a more complete escape, which, by bringing the uterus to bear more powerfully and directly upon the surface of the child, no doubt increases the risk in all such cases. The foot is very liable to be mistaken by beginners for the hand, for, although any one could distinguish between the two with the eyes shut, if he could bring the whole of his ten fingers to bear upon it, it is a very different matter when he attempts to recognize a part which can only be reached by a couple of fingers, and that possibly with difficulty. The length of the digits, and the mobility of the thumb as compared with the great toe, will prevent the possibility of doubt when we can recognize these points, but under circumstances of unusual difficulty this may be impracticable. No single anatomical feature of the foot is, in difficult cases, so characteristic as the prominence of the heel. The dorsal surface of the hand may be mistaken for the instep and the

fingers for the toes, but on the other side of the joint there is nothing in the hand which can be compared to the projection of the heel. If, therefore, we can pass one finger over the dorsum of the foot, and another over the heel, which enables us to grasp the extremities of the limb like the head of a crutch, we may be perfectly confident that it is a foot and not a hand with which we have to deal. And we would here observe, parenthetically, that this is one of many points, in regard to which the young practitioner should lose no opportunity of perfecting the *tactus eruditus*; for a mistake here, which is acted upon by operative or other interference, may bring discredit upon him, and, what is worse, may directly lead to the most disastrous results. The determination of the position from a single foot is a matter in reference to which some doubt may exist. The general direction of the toes will, however, indicate the abdominal surface of the child, and if both feet should present, this is much more certain. We may, however, have to wait for the descent of the breech before we can be certain to which of the four positions it is to be referred. A single foot should always, if possible, be identified as right or left, which is very easily done, if it be sufficiently within reach, by placing the palm of the hand to the sole of the foot in the same manner as is pursued in identifying a single hand, as will be more particularly described afterwards.

The risk to the mother in presentations of the pelvic extremity is in no way increased; for, admitting that the opinion generally expressed in regard to the tardy completion of the first stage is correct, we may assume that this is fully compensated for by the comparative ease with which the child makes its way through the passage. But the figures already quoted, which are confirmed by the experience of every one, show only too clearly that the risks to which the child is exposed are enormously increased. It is equally certain,—as, indeed, is further indicated by the figures alluded to,—that the risk is not the same in all cases of pelvic presentation alike, but is greatly increased in those cases in which the thighs are extended, and not flexed upon the trunk. The cause of this is to be found, as has already been incidentally remarked, in the inefficient manner in which the canal is thus dilated for the passage of the head, which delays the completion of the labor at the critical moment when, all being born but the head, it is arrested in the pelvis until the life of the infant is destroyed by suffocation. In an ordinary breech labor, the more complete dilatation of the parts reduces this risk to a considerable extent, but even under the most favorable circumstances the risk is, as compared with cranial births, enormously increased. And it is none the less certain that, by prompt and skilful measures, the accoucheur will often have the gratification of saving lives which, if left to nature, would have inevitably been sacrificed. A thorough knowledge of the mechanical phenomena above detailed, is the first essential qualification which may lead to skill and judicious management in the treatment of all cases of pelvic presentation. In order thoroughly to understand the subject, however, we must view it under various aspects. While we have no difficulty, for example, in recognizing that, in many instances, assistance is necessary, we must not overlook the fact that injudicious interference is bad. We have to

the unyielding cranium,—a state of matters which, if complete and continuous, rapidly destroys the child, by interrupting the placental circulation. We should, at this stage, pull down a loop of the cord, thus obviating the probability of obstructed circulation by overstretching, and at the same time guide it, if possible, in the direction of either sacro-iliac synchondrosis,—where the risk of pressure is least,—choosing, if choice there be in the matter, that sacro-iliac synchondrosis which corresponds to the side of the child's head. Much useful information as to the prospects of the case is afforded by grasping the cord with the finger, so as to feel its pulsation. So long as this remains quite vigorous, the case is to be left entirely to nature; but we must repeat the observation frequently, as the descent of the head may expose the cord quite suddenly to fatal pressure,—a fact which it is of the highest importance immediately to recognize. The persistence or failure of funic pulsation are, in fact, the chief indications as to the necessity for operative interference.

Exceptional circumstances, no doubt, may arise to call for assistance at a stage even earlier than that which we are describing. Long detention of the breech within the cavity, owing to disproportion of the foetal or maternal parts, or to *inertia uteri*, may call for action at an unusual period, on the same general principles as obtain in the case of obstructed cranial labor. The operative procedure proper to breech cases is, however, peculiar; and, if we fail, by the use of ergot or otherwise, to arouse the dormant energy of the uterus, or should we recognize an obstruction which natural efforts cannot overcome, we must be prepared to act with a view to speedy delivery. The forceps, being specially constructed for application to the foetal head, are not available. The vectis, however, applied over the flexure of one thigh, while the hand of the operator is applied to the other, may possibly succeed; and the blunt hook is an instrument which has been frequently recommended in the management of such cases. No one can doubt the mechanical power of these, and especially of the blunt hook; but the danger of bruising, and even lacerating, the parts of the foetus is not inconsiderable, so that such means should, if possible, be avoided. When the child is dead, and much force has to be employed, the blunt hook, and even the crotchet may be applied,—the use of which instruments will be more particularly detailed when we come to consider obstetric instruments and their use, under a special section. By the fingers alone, introduced over the groin upon the flexure of the thighs, the breech, in a very considerable proportion of ordinary cases, may be drawn down under the pubic arch, the operator remembering always, and imitating, as far as possible, the natural mechanism of the act. This is in all cases to be preferred as the safest; but, should it fail, a second mode is still available, which is much safer than and therefore to be preferred to any variety of instrumental delivery. What is required for the operation is a handkerchief, or, what we have found even more satisfactory, a skein of cotton yarn. One end of this is to be passed between the thighs and the abdomen, in the flexure of the groins, to the corresponding point on the other side, where it is to be

child. If dragged down roughly, and without any reference to direction, fracture of the humerus may occur, as has indeed often taken place in the hands of the ignorant or unskilful. The one arm being released, the head will probably descend a little further, and the other coming thus more into reach, is to be treated in the same manner. We must be careful, during the passage of the shoulders, that the perineum is neither distended in such a manner, nor in such a direction, as to endanger its integrity. The head, after the birth of the shoulders, now occupies the cavity of the pelvis, and the face, in almost all cases, will be found to have rotated into the hollow of the sacrum.

This is the stage of greatest danger, and that at which the life of the child is most frequently lost. Consequently, this is the moment which requires the most constant attention, and at which assistance has generally to be afforded. The powers of nature are, in a large proportion of cases, quite sufficient to complete the delivery, so that even here there exists no necessity for operative interference as a point of routine duty. We must still, therefore, be guided by the circumstances of the case, and no single sign affords us more reliable information as to the urgency of the case than, as before, the funic pulsation. The cord, however, now becomes exposed to more powerful pressure, and, at the same time, the function of the placenta is seriously interfered with, if not wholly arrested. The absence, in breech cases, of the not inconsiderable quantity of liquor amnii which remains in ordinary presentations till the last, allows of the firm compression of this organ between the head of the child and the uterine walls; and, even should this not take place, the great contraction of the uterine vessels allows of but a scanty supply of maternal blood for the oxygenation of that of the fetus. This, then, may truly be called a critical moment, in which, although placental respiration has all but ceased, aerial respiration is as yet impossible. A life trembles in the balance, and a few minutes, at furthest, will decide its fate. Impending death from asphyxia is indicated in such cases not only by a failure in the circulation of the cord, but by failure of the heart's action, as observed by the stethoscope, and by convulsive movements of the respiratory muscles. Such spasmodic attempts to fill the lungs with air are of the nature of reflex actions, excited probably by the contact of carbonated blood with the nervous centres. They indicate, therefore, impending suffocation, and call for immediate action. It is assumed, of course, that before matters have gone so far as this, we have in readiness such restoratives as may be approved of, hot and cold water, and the forceps—everything, in fact, which may be requisite, whether for the delivery of the child or its restoration, should it be born, as frequently occurs, in a state of suspended animation.

When the signs just mentioned indicate that the moment for operation has arrived, we must act without a moment's delay, a few seconds making all the difference between success and failure, life and death. The body and shoulders must not be grasped and pulled directly downwards, as is sometimes done. To do so would probably defeat our object, by pulling down the occiput towards the pubic arch, instead of favoring the natural movement of flexion; and besides, forcible traction

to dragging upon the neck, apply the forceps without delay to the sides of the child's head, and thus complete the delivery. If the child does not at once breathe, the usual means described under suspended animation must be adopted, and persevered in, so long as the slightest chance remains of preserving the life of the infant. Any exceptional circumstances which may constitute impediments to delivery, must be managed on general principles; and, in extreme cases, it may even be necessary to perforate behind the ear, and allow the contents of the antrum to escape. Should the child be dead, many of the precautions above detailed will of course be unnecessary.

CHAPTER XX.

TRANSVERSE PRESENTATIONS: COMPLICATED PRESENTATIONS.

TRANSVERSE PRESENTATIONS: THE ARM OR SHOULDER THE PRESENTING PART—CAUSES OF—SIGNS OF, BEFORE AND DURING LABOR—PREMATURE RUPTURE OF THE MEMBRANES TO BE AVOIDED—DORSO-ANTERIOR AND DORSO-POSTERIOR POSITIONS—DETERMINATION OF EXACT POSITION BY OBSERVATION OF THE HAND—PROBABLE COURSE OF AN UNAIDED CASE—OCCURRENCE OF SPONTANEOUS EVOLUTION—SPONTANEOUS EXPULSION—METHODS OF OPERATIVE ASSISTANCE: PERIOD OF LABOR TO BE SELECTED: CEPHALIC VERSION: PODALIC VERSION: METHOD OF COMBINED EXTERNAL AND INTERNAL MANIPULATION: SPECIAL DIFFICULTIES—PROCEDURE MODIFIED IF CHILD DEAD—COMPOUND OR COMPLICATED PRESENTATIONS—HAND AND HEAD—HAND AND FOOT, ETC.—GENERAL MANAGEMENT OF THESE.

IN the Cross Birth of Hippocrates, the axis or long diameter of the fetal oval is thrown across the womb—the most unfavorable position which could by any possibility be selected. There is scarcely a point on the surface of the trunk of the body in regard to which we may say that its presentation at the os uteri is impossible, and it is not to be wondered at, therefore, that some writers have described an infinite variety of Transverse Presentations. Experience has, however, shown that, whatever may be the case with a premature or putrid foetus, the presentation of a mature and living child, which has unfortunately assumed this position, is generally a presentation of the arm and shoulder from the first. And, moreover, in the exceptional instances in which some portion of the dorsal, thoracic, or abdominal surface presents, it has been found that these are usually converted into arm presentations by the descent sooner or later of that limb. For these reasons, and for this additional one—that the mechanism in all transverse cases is essentially the same—cases of cross birth may be considered solely as arm presentations; and, when these have been fully described, it will be found that little remains to be specified in regard to the other possi-

ble presentations of the trunk. In point of fact, it is to presentations of the arm or shoulder alone that the terms "faulty" or "preternatural" are properly applicable. According to the elaborate statistics of Dr. Churchill, the superior extremities enter the pelvis in advance of the rest of the foetus once in 231½ cases.

The Causes of transverse presentation are, although obscure, probably somewhat less so than in the case of the breech. Any fault or deformity in the structure of the pelvic brim, which may act by preventing the descent of the head into the cavity, may turn aside, towards the iliac fossa, that extremity of the foetal oval, when the shoulder may slip down and take its place. In like manner, an unusual quantity of liquor amnii may, by destroying the oval form of the uterus, indirectly encourage the displacement in question; while uterine obliquity, and a premature expulsion of the foetus, are also admitted by most writers as circumstances which may possibly act in a similar manner. The unfortunate tendency to a recurrence of this, in women who have already had a child or children presenting by the superior extremity, would almost seem to indicate that some anatomical peculiarity of the parts may be the cause; and it was this which led Wigand to suppose that the form of the uterine cavity was the determining cause, and that, in those cases in which cross birth occurred, the transverse diameter of the uterus was in the first instance augmented, the long diameter of the cavity being thus relatively diminished.

There are signs which, when distinct, may lead us, before the occurrence of labor, to suspect the existence of a transverse position; but it is very doubtful whether they can ever enable us to form a confident opinion, until the presenting part comes within reach of the finger. In many cases, the belly of the woman is peculiar in shape, and elongated in a transverse direction; and, if the abdominal walls are lax and thin, we may possibly be able to recognize a tumor in each iliac fossa, one of which is more resistant and spheroidal, and the continuity between which may be established on palpation. In every instance, the presenting part is unusually high, but the mere negative evidence of the absence of the head in the pelvic cavity can never be admitted as important. It has been stated that it is sometimes possible to distinguish the hand, elbow, or shoulder, through the anterior wall of the uterus, from the vagina; but this could never, under any circumstances, amount to more than presumptive evidence. Nor does the stethoscope give us any reliable information; but there may be cases, as Cazeaux observes, in which our diagnosis may receive some aid from this source. "If," he says, "the vaginal examination has resulted in the recognition of a portion of the foetus which is of small bulk, and if we perceive the pulsations of the heart in the hypogastric region, we may almost certainly conclude that it is the superior extremity. If we heard the heart at the level of the umbilicus, it would in all probability be a leg." It happens, even more frequently in transverse than in breech presentations, that it is impossible to reach any portion of the foetus with the finger alone in the earlier stages of labor; but, in some of these, the nature of the case will be recognized by introducing a portion of the hand. A marked effect of the height at which the foetus stands, is slow

and comparatively painless dilatation of the os; and, when the bag of water forms, it is, as in the case of the breech, very different in shape from that which precedes the head. In transverse presentations, the shoulder is the part which usually offers itself at the os uteri; but, as a considerable period often elapses before it comes within easy reach of the finger, it is often not recognized until labor has made some progress, a fact which bears in an unfortunate manner, as we shall see, upon the ultimate issue of the case.

It is, indeed, of the very highest importance that, if we have to deal with a cross birth, we should recognize the position as soon as it is possible to do so; so that the moment we discover a shoulder, an arm, or a hand, we should not desist until we have exactly, and to our perfect satisfaction, ascertained the position of the child. The prominence of the shoulder may be confounded with that of the tuber ischii, but may readily be distinguished by the absence of a similar tuber, at a little distance, with the genital organs between; and, should this negative evidence not be deemed sufficient, the finger passed towards the axilla, so as to feel the ribs, will remove, if they can be reached, such doubts as may remain. Care must be taken, in such manipulation as may be necessary, to avoid rupturing the membranes; for, so long as the child is not forced down upon the brim, and these remain intact, they are probably fulfilling their normal function of dilating the os, a process which should not, if possible, be interfered with. But, should the membranes be ruptured, or the shoulder be forced downwards into the cavity of the pelvis, and if we are still in doubt, it will be proper cautiously to pull down the arm and hand, which enables us not only to make sure of the presentation, but to recognize the particular position by a simple method to be hereafter described. There is no evidence that this procedure has any bad effect upon the progress of the case or otherwise, and the unanimous opinion of the most experienced accoucheurs is that, if carefully done, it is quite free from risk. But, even if a certain amount of risk necessarily attached to the operation, we would be perfectly justified in incurring it, in preference to attempting the management of the case without certain knowledge as to the position of the child. Some difficulty might occur in distinguishing the parts if not within easy reach. The manner in which the hand is to be made out under such circumstances has already been referred to in the preceding chapter; but if, as will generally be observed, the arm hangs down into the vagina, there can be no difficulty whatever in distinguishing it from the lower extremity even by the unexperienced. The anatomical characters of the knee and elbow would enable us to distinguish also between these parts in the unlikely event of such a difficulty arising.

We have alluded to the caution to be exercised in manipulating, so as to avoid premature rupture of the membranes. There is, however, one advantage in this mode of procedure to which we have not alluded: this is the possibility of rectification of the transverse position. This has been observed by competent persons too often as a spontaneous occurrence, to admit of doubt as to its being an exceptionally fortunate issue of the difficulties of such a case; but, it must be manifest that no

such alteration in the axis of the child can occur when the waters have drained away, and it is grasped firmly by the uterus and forced in part into the cavity of the true pelvis. And not only this, but we have every reason to believe that the change may, in favorable circumstances, be effected by skilful manipulation, and more especially by a method to be afterwards described, which is best known as that of Dr. Braxton Hicks.

If we except certain complicated and unusual cases to be afterwards alluded to, we may refer all transverse presentations to two varieties,—Dorso-Anterior and Dorso-Posterior—of which the former is more frequent in the proportion of two to one. In *dorso-anterior* positions the

FIG. 121.

FIG. 122.

Transverse presentation—Dorso-Anterior.

Transverse presentation—Dorso-Posterior.

back of the child is, as in the corresponding positions of the pelvic extremity, turned forwards. But, as the head may lie either to the right or to the left, there are thus two varieties of this position, in one of which, the head being to the left side of the mother, the right arm presents; while, in the other, the head is to the right, and consequently the left arm is the presenting part. These varieties bear no relation whatever to the pelvic diameters. Nor, if we consider that they are preternatural as regards the uterine diameters, can we even admit that they bear any such possible or practical relation to these, as would warrant us in placing them in the same category as the positions of the ends of the fetal oval, which we have hitherto been considering. There is here no question—primarily at least—of oblique, transverse, or conjugate diameter, so that a separate description of the two varieties of dorso-anterior position is quite unnecessary. The same remark applies to the *dorso-posterior* position, which in like manner offers itself for consideration under two varieties. In one, the head is to the right, and the right arm presents; in the other, the head is to the left, and the left arm presents. As regards the two principal positions mentioned, as well as their varieties, it is unnecessary to enter upon any elaborate description, as the management is in all cases essentially the same. The nature of the operative procedure which, in the great majority of instances, is necessary in

the treatment of transverse presentations, renders it important that we should begin by ascertaining the exact position of the foetus. Indeed, should we make a mistake in this particular, we know of a certainty that our error adds to the maternal risk, which is already considerable. Of great importance, therefore, is it that we possess the power of discriminating between the four varieties of transverse presentations which have been alluded to.

The points which we wish to ascertain are,—to which surface of the womb, anterior or posterior, is the Back of the child turned? and, to which side, right or left, is the Head directed? To ascertain this by passing the hand within and around the womb would of itself be a serious operation; but we have fortunately a safe and certain means by which, under all ordinary conditions, we may at once determine the exact relation which the child bears to the uterine walls, and so modify our operative manipulations accordingly. The information in question is to be derived from a careful examination of the arm which presents. Prior, therefore, to any operation which we may find it necessary to perform, with a view to the rectification of this faulty position, we must pull down the arm, and carefully observe it, unless, indeed, our examination of the presenting shoulder, and the parts beyond, should have sufficed clearly to establish the position of the child. The point to be first ascertained is, as to the presenting arm, whether it be right or left. This is determined, in the simplest possible way, by the accoucheur placing the palm of his hand against the palm of the child's hand, when, *if the thumbs correspond, so do the hands*. For example, if he employs, as most people do, the right hand, and finds the thumb of the child correspond to his little finger, he knows that it is the left hand, while if he finds them thumb to thumb, it is the right. This is a certain guide, and one in reference to which there is no possibility of fallacy; but the information which is thus afforded is but limited, and only indicates that we have to deal with one of two possible positions. A more careful examination of the hand gives us complete and certain information, so that we know exactly where to find the anterior and posterior surfaces, and the head and feet of the child. The following rule is all that it is necessary to remember,—*The hand of the child being supine, the Palm corresponds to the abdominal surface and the Thumb points to the Head*. Here, however, there is a possible source of error, which, if not avoided, will inevitably lead to wrong conclusions. For, a moment's consideration will suffice to show that, if we omit to make sure that the hand is supine, we run the risk of its being pronated, which, by turning the palm towards the back, and the thumb towards the feet, may lead us to form an opinion which is, in every respect, wrong. Before making the observation, therefore, be sure that the hand is supinated—when error becomes impossible.

When the body of the child presents at the brim of the pelvis, in a transverse position, the labor almost invariably requires at the hands of the accoucheur the assistance of art. Indeed, it may be said that, if the pelvis be normal, and the foetus living, mature, and of average size, it is impossible for the woman to be relieved by the unaided efforts of nature. The progress and termination of such a case would proba-

bly be as follows: After a tedious first stage, in which the dilatation of the os is unsatisfactorily effected, the membranes rupture, and the arm descends into the pelvis, either primarily, or, when the shoulder originally presents, after the labor has made some further advance. When this occurs the pains become much more severe and strong, and with each succeeding effort the shoulder is forced down and wedged into the cavity of the pelvis. The head being situated, however, to one side, and the breech to the other, progress beyond a certain point is manifestly impossible, so that when the utmost degree of moulding is attained of which those parts are susceptible, and the base of the wedge has entered the pelvis as far as the mechanical conditions will permit, no amount of uterine or other propulsive effort can produce the slightest effect. Left to nature, and attended with powerful uterine action, such a case must ere long involve the life of the child, not less by the great and continuous pressure on the neck and other vital parts than by the implication, from the same cause, of the placental circulation. The actual degree of the pressure is further shown by the tumefaction of the limb which hangs down into the vagina, or protrudes partially from the ostium vaginæ. The sufferings of the mother are in no way alleviated by the death of the child, but, on the contrary, every minute of such fruitless effort renders her position more and more precarious. The continued pressure on the soft parts of the parturient canal may destroy in this way the vitality of those portions which are most exposed to its influence, when sloughing, more or less extensive, will occur, from the effects of which, coupled with the prostration and exhaustion which gradually wear out her powers of constitutional endurance, her sufferings are terminated by death. Or, at any stage of the labor, rupture of the uterus may occur, and a similar result will necessarily ensue.

Under certain circumstances, however, such as a putrid or immature foetus, or a pelvis of unusual size, nature may relieve herself by a spontaneous process of delivery. One of these processes is associated with the name of Denman. This distinguished obstetrician found that, under conditions similar to those above noted, what he termed *Spontaneous Evolution* occasionally occurred. In those cases, the shoulder, or point of the wedge, did not maintain its position in the pelvis, but moved upwards, during the continuance of the pains, towards the brim of the pelvis, on that side which the head originally occupied, the head itself moving in a corresponding direction in the iliac fossa. This ultimately made way for the nates, which descended towards the floor of the pelvis, when labor terminated as in a case which had been from the first a presentation of the breech. This observation of Denman's was hotly controverted by some of the most eminent obstetricians of the day, with the ultimate result, however, of establishing the correctness of his views. The controversy, moreover, by directing general attention to the phenomena of spontaneous delivery, resulted in a thorough elucidation of the whole subject, from which it transpired that there was another process, and one of more frequent occurrence, according to which a similar result ensues. The credit of first describing this is generally attributed to Dr. Douglas, of Dublin, who, to dis-

asmuch as the child's life is sacrificed, and that of the mother is placed in imminent peril. It is scarcely possible in these days that, in this or any other civilized country, a woman would be suffered to die undelivered, for sooner or later assistance would be sure to reach her. Such assistance, however, there is too good reason to believe, may be afforded at a period when the vital powers have already begun to flag, when the arm and shoulder are already wedged down in the pelvis, and when the life of the child has long been destroyed. All these circumstances increase very greatly the gravity of the case, and may often lead us to despair as to its ultimate issue; but, whatever the difficulties may be, the educated accoucheur must be prepared to cope with them, and to act in every case, even the most desperate, in such a manner as may at least give the mother what chance human skill can afford her. No one point, therefore, is of such importance as this,—that we should recognize the position at the earliest possible moment. If we have the good fortune to do so early in the labor, we may look upon the case with calm self-reliance, knowing that the issue lies in a great measure in our hands. No pressure having at this time compromised the life of the infant, we hear its heart beating vigorously, and we may possibly feel it move; while the maternal parts have as yet been subjected to no mechanical violence. No details are requisite to prove that, in the two classes of cases referred to, the prospect of success is very different, and we therefore repeat that nothing, in point of importance, is to be compared with an early recognition of the case. This enables us, moreover, to select the time at which we may act with the greatest probability of success.

The choice thus afforded us must be taken advantage of with discrimination, and in full view of the facts which have been detailed. The responsibility which devolves upon the accoucheur in such a case, renders it essential that his services should be at command on any emergency, as in the event of the moment favorable for operation arriving somewhat earlier than he might perhaps have been prepared to expect. For, as will presently be made apparent, this period may be of short duration, and if it be not taken advantage of, the case may pass very rapidly into another category, in which the risk to mother and child is greatly increased. It is of the first importance, as has already been mentioned, that the integrity of the membranes should be preserved as long as is possible. Any clumsiness or violence of manipulation during the course of an ordinary vaginal examination, may thus, by causing the escape of the waters, not only permit of the descent of the abnormal presentation, but may, by complete evacuation of the liquor amnii—upon the same principle as in pelvic presentations—bring the uterine walls into immediate contact with the surface of the child. This is all the more likely to occur if we examine during a pain, so that we should carefully avoid examination at this moment, or at least conduct it with special caution. The patient is to be confined strictly to the horizontal posture, but so long as the child is alive, be os but partially dilated, and the presenting part still high, it is better to wait than to attempt a forcible dilatation of the os, which would most likely involve a rupture of the membranes. This is the

period, however, at which an attempt at rectification may be made with considerable prospect of success, if we combine the use of the finger internally with the external manipulation of Wigand, according to the method recommended and practiced by Dr. Braxton Hicks. After having ascertained the exact position of the child, or at least the side to which the head is turned, this may be effected by pressing the shoulder upwards from the vagina, while the head is pressed down towards the brim of the pelvis, and if necessary retained there, by the other hand which is applied to the surface of the abdomen. The process effected by this manœuvre is what is termed *Cephalic Version*. The same result has been successfully attained by Hamilton, Gooch, and others, by manipulation which is purely internal, and by Wigand and Martin, by a method in which the manipulation is exclusively external, but it is to the distinguished obstetrician named above that we owe the combined method.¹ This subject will be more fully noticed under the head of *Turning* in a special chapter, so that we shall only mention here such points as are incidental to the peculiar case which we are now considering.

The treatment, according to almost all authorities, which is most applicable to transverse presentations, is the operation generally known as *Turning* or *Podalic Version*, to be afterwards more particularly described. Should this operation be determined upon from the first, the condition of the membranes is of even greater importance than before, and the state of matters which is most favorable to its successful performance is to be found when the os is in such a condition, as regards dilatation or dilatability, as to permit the passage of the hand, while, as yet, the liquor amnii has not escaped. Waiting patiently till full dilatation has been attained, or till rupture of the membranes takes place, increases in no way, as we have seen, the risks of the case. But, so soon as either event occurs, we at once proceed to the operation by introducing the hand, seizing the feet, and bringing them towards the os uteri, whence the shoulders will recede, under such circumstances at least, without difficulty. The mode previously detailed of ascertaining the position of the child by observation of its hand must here be practiced if necessary, as the result of an error in this respect, or a haphazard introduction of the hand within the womb, will greatly increase the risk to the mother which attends the operation, even when most skilfully performed. The position of the child being ascertained, the palm of the child's hand will indicate the abdominal surface, to which the hand of the operator should always be directed, while by pushing the hand in the contrary direction to that in which the thumb points, the feet will most easily be attained, and at a minimum of risk. In this case also, the method of combined version is equally applicable as for cephalic version. And it requires no argument to show that, if it be practicable thus to effect the object in view, an operation which consists in the introduction of one or at most two fingers into the uterine cavity, must involve less risk than necessarily attends the

¹ See Dr. Braxton Hicks's Memoir "On Combined External and Internal Version." London, 1864.

ordinary procedure of turning by the feet. That it is practicable, we have had several opportunities of demonstrating, and it is without any hesitation, therefore, that we recommend that this method should in the first instance be tried in every case, and the more severe operation only in those instances in which the former fails. As in cephalic version, it is better to attempt rectification so soon as the os has sufficiently dilated to admit the finger, and to permit an accurate diagnosis. With the escape of the waters, the mobility of the fœtus is, for obvious reasons, diminished.

The following, from Dr. Hicks's published cases, is a striking instance of how, even under most unfavorable circumstances, combined version may be practiced with perfect success.

"Mrs. M—, admitted into Mary Ward in April, 1861. The antero-posterior diameter of pelvic brim measured only two inches and one-eighth, which had caused her labor to be accomplished with the greatest difficulty; embryotomy being employed on the last occasion, although brought on at the seventh month. Labor was induced on 13th April last, in the seventh month of this, her fourth pregnancy, by puncturing the membranes. Pains came on in about sixty hours, after which they continued to increase for twenty-four hours, at intervals of five minutes. The os uteri was then about the size of half a crown, still unyielding, scarcely admitting two fingers. The liquor amnii still existed in small quantities, draining slowly away. The shoulder presented, the head being to the right side, the breech to the left, but both approaching the fundus, the child being somewhat doubled on itself. As it was of much importance to rectify the presentation before the os dilated, so that the presenting part might not be driven lower down; and as the footling presentation seemed, with so narrow a brim, and a small soft head, to give the best chance for the life of the fœtus, I decided on attempting podalic version. The patient was put under the influence of chloroform. The left hand was introduced into the vagina, with two fingers through the os, and the presenting part pushed in the direction of the head, while the right hand pressed down the breech from without. The fœtus did not glide round in the uterus very easily, for it was tightly clamped by it, and every movement within or without produced uterine action, consequently it required a little patience; but by varying the position and direction of the outside pressure, the foot was at last drawn into the os by two fingers. The chloroform was discontinued, and after about half an hour, slight expulsive pains appearing, gentle traction was made upon the child. It was not long before the os dilated and the child was brought down during the pains. Some detention of the head took place at the brim, in consequence of the very narrow antero-posterior diameter, and the child's life was lost. The mother did very well."

The really difficult cases, and those in regard to which apprehension will naturally arise, are those in which we have to act after the shoulder has descended in the pelvis, and when the body of the child is tightly embraced by the womb. No attempt should be made under any circumstances to replace the hand and arm, should these have prolapsed; and it will generally be proper, before proceeding to operate, to allay the excited irritability of the uterus, which shows a spasmodic tendency to contract under the slightest stimulus. Of various means at our command, that which is most suitable for this purpose is chloroform, and if the patient be well brought under its influence, it is wonderful to what extent we succeed, in some instances, in relaxing the parts, so as to admit of the easy passage of the hand. In every case, however, such an operation is attended, as compared with one performed at an earlier stage of the labor, with greatly increased risk, the danger being in direct proportion to the amount of resistance encountered in an attempt to

pelvis of large, or even of ordinary dimensions, there is nothing to prevent a satisfactory termination of the labor; but, if the pelvic diameter should chance to be ever so little out of proportion, the presence of the arm may make all the difference in the world, and suffice to jam a head which would probably have passed, under the ordinary conditions, with very little more difficulty than usual. Nay, even when a hand presents on either side of the head, there is nothing absolutely to prevent the birth of the child, which has, in fact, been observed to pass, under such circumstances, without any marked difficulty whatever; so that, in both of these instances, we have to deal with conditions very different to those which obtain in cross-births. But the chance of delay and protracted suffering is sufficient warrant for us, in such cases, to attempt a rectification of those positions, if only this can be effected without incurring the risk of making matters worse. What we wish to do is to push the arm upwards, so as to allow the head to descend, and alone to occupy the cavity of the pelvis. In making such an attempt, however, we must be particularly careful not to displace the head; for if the result of our interference were to be that the head was moved from the brim to the iliac fossa, and the shoulder thus permitted to descend, we would, in plain language, find that we had converted a tolerably easy position into one of the most unfavorable which it is possible to conceive. For this reason, it is generally better to avoid all such attempts until the head has entered, or is becoming engaged in the pelvic brim. If we then use ordinary caution in our manipulation, we may attempt, without hesitation, to effect our object by pressing the prolapsed limb steadily upwards; and, along with this, we may try to retain the head against the brim, in such a manner as to prevent the slipping down of the arm, until the uterine efforts have caused the head to descend so far that this is no longer possible. This latter indication has been successfully fulfilled by combining external with internal manipulation, and that in a manner which would encourage us to repeat the manœuvre on any occasion which might occur.

The Feet and Hands, or one of each may present, and thus constitute what may be termed an unusual variety of transverse presentation. It is a common occurrence, in this variety, to find prolapse of the funis as a further complication, and one unfortunately which will add in no small degree to our perplexity. As we could scarcely expect in such a case to replace both limbs, and as prolapse of the cord of itself involves very serious danger to the life of the fœtus, the very obvious and proper procedure is to drag down the inferior extremity, and thus complete podalic version. For, if we leave it to nature to select by which of the poles of its long diameter the child will descend, it is more than probable that the shoulder will slip down, and the difficulties of the case will then be very greatly aggravated. Or, as is still more likely, the upper and lower limbs will together become wedged into the pelvis, and the progress of the labor be as effectually barred as in the ordinary transverse position. If the mobility of the fœtus within the womb is as yet not seriously interfered with, no great difficulty will be incurred in the operation, and as the child revolves, its arm will leave the vagina and follow the head in its movement towards the fundus. But, if the

nts, at once to proceed to the operation. Version was, however, in this instance, only effected with extreme difficulty, in the manner above described, by the hand and the fillet. When the child was born it was found to assume, as if from imperfect cadaveric rigidity, the position which it had occupied within the pelvis. This was so characteristic that a cast was taken, of which the drawing is a tolerably correct representation. Other presentations, in addition to those enumerated, may, as we have said, be met with, but the above will suffice to indicate the general principles upon which the treatment of all such is to be based.

All cases of transverse and complicated labor are attended with greatly increased risk as regards the child; and even under the most favorable circumstances, with a considerable addition to the dangers which women undergo in childbed. In the former class it has been found that, even including those cases in which the most skilful assistance has been afforded, more than a half of the children perish, while, as regards the mother, the deaths are about one in nine. The fatality in both depends, in a very great measure, as all experience has shown, upon the period or stage of the labor at which assistance is first afforded.

CHAPTER XXI.

FUNIS PRESENTATION.

“PRESENTATION” AND “PROLAPSE” OF THE CORD—RELATION OF THE FUNIS TO OTHER PRESENTATIONS—CAUSES OF—SYMPTOMS OF AT VARIOUS STAGES OF LABOR—GREAT DANGER TO CHILD—TREATMENT: AT FIRST EXPECTANT: AVOID RUPTURE OF THE MEMBRANES: REPOSITION BY THE FINGERS; BY MECHANICAL APPLIANCES: VARIOUS REPOSITORIA DESCRIBED: POSTURAL METHOD: USE OF THE FORCEPS: TURNING.

SOME writers have, without any obvious advantage, drawn a distinction between “presentation” and “prolapse” of the Umbilical Cord. By the former term is implied those cases only in which a portion of the cord is situated in the lowest part of the amnionic cavity, so that it may be felt from the vagina; either through the inferior portion of the uterine wall, or through the membranes when the finger can be passed by the os. Prolapse, again, is restricted to cases in which, after the rupture of the membranes, a loop of the cord passes into the vagina, or even hangs from the vulva—in both cases preceding that portion of the child’s body which presents at the os uteri. Such a distinction as this is, in so far as classification is concerned, obviously useless, seeing the Prolapse is merely a more advanced stage, and an almost inevitable sequence of the Presentation.

At the beginning of labor, the funis may present alone at the os, and may be felt to occupy the bag of waters before the child has

more likely to prevent the accident, by a firmer contact than usual with the inferior part of the uterine cavity. But it is otherwise with a narrow pelvis, and more especially in such instances as show marked contraction at the brim. In these the descent of the presenting part, and the occupancy by it of the inferior part of the womb, are mechanically hindered to such an extent that the cord is either forced down by the uterine contraction into the bag of waters, or, upon the escape of these, is carried past the arrested head by the impulse of the momentary torrent. Cases of this kind have been recorded by Mr. Robertson, of Manchester, who has paid particular attention to the subject.

There is, probably, no cause which acts more decidedly in producing this unfortunate position of the cord than the presentation of the child. The more thoroughly is the lower region of the womb occupied by the corresponding portion of the child, the less likely is prolapse; and we find, therefore, that the less effectively this condition is maintained, there is, in direct proportion, increased danger to the cord. In the case of cranial positions, a very superficial observation of the facts of the case will suffice to show how admirably adapted these are to the mechanical prevention of the displacement in question. It is true, indeed, that it is not the head which, in the first stage of labor, presses during a pain upon the os, and it might be assumed, as by no means improbable, that the cord should slip down into the interval between the membranes and the head. But a more close attention to the mechanism of a labor-pain,—which has been fully described in a previous chapter,—shows that nature, apparently, provides against the possibility of such a movement on the part of the cord, by commencing the contraction in the cervix, from whence it passes upwards, and thus, by a sort of peristaltic contraction, maintains the relative position of the parts, which is only likely to be disturbed, under such peculiar circumstances as have been above detailed. So soon as rupture of the membranes permits of the immediate application of the head to the circumference of the os, the same action, beginning in the sphincter fibres of the uterus and exercised equally upon the spheroidal cranium, still more effectually prevents displacement.

It is widely different in the other presentations of the child, which we may here consider together. In the case of the face, the conditions approach more closely to those of vertex positions than any other; and we thus find, as we might have anticipated, in the table quoted above from Scanzoni, that these are, next to the cranial positions, the most favorable. As regards the presentation of the nates, we have here also a rounded mass, occupying the lower segment of the uterus, in a manner which in most cases is sufficient to maintain the position of the cord. That its descent occurs in a much larger relative proportion of cases than in cranial positions, is to be accounted for by various circumstances. We cannot fail to observe, in the first place, that there is not the same regularity in the circumference of the presenting breech as in the case of the head. There are thus, necessarily, various points at which the contact between the uterus and the presenting mass is comparatively insufficient, so that the cord may easily glide down at those points where the resistance is least. We can easily conceive it possible

prolapse, no difficulty will be met with in perfecting the diagnosis, as the cord may now be felt more distinctly, rolling beneath the finger, and its pulsation may be ascertained by compressing it directly between the fingers; while the fingers and toes, should these parts have given rise to doubt, may, by a similar method of examination, be readily distinguished. There is one possible, though, perhaps, scarcely probable source of error, against which the inexperienced observer must here be on his guard. It occasionally happens that, in extensive rupture of the uterus, a coil of the small intestine passes through the aperture into the uterus, and even into the vagina; and, although the presence of the mesentery and the absence of pulsation should in such cases obviate the possibility of mistake, the sensation which the bowel yields bears such a resemblance to the cord that an opinion might rashly be formed, which might lead, in practice, to the most disastrous results. Several cases, at least, have been recorded in which this blunder has been committed, with the most discreditable and unfortunate issue.

As regards the mother, there is no risk whatever in a presentation of the funis. Experience has, however, shown that, of all possible presentations, not even excepting transverse cases, nothing is more fatal to the life of the foetus. Of all cases, and without any reference to the fact of assistance being rendered, it is certain that considerably more than one-half of the children are lost, which is sufficient to show that the treatment or management of the cord, in these cases, during labor, is necessarily one of the most important points which can possibly arise in the course of practice. What we desire to effect is the protection of the cord from such pressure as may arrest the circulation, or, in other words, to avert, if it be possible, from the child the danger of death from asphyxia. We have already seen, in reference to presentations of the pelvic extremity, that the chief cause of increased mortality in these cases is pressure on the cord, and the same remark obviously applies with equal force to all cases of transverse or other presentations in which podalic version is practiced. But, unless there should be prolapse, the danger is confined to the later stage of labor, during which the cord is subjected to pressure between the head and the pelvic walls. If the cord presents originally, the vessels are obviously subjected to a more prolonged and continuous pressure, so that the danger is considerably increased. When, in any case, the labor-pains are frequent, violent, and of long duration, the chance of the child's life is small, unless delivery should be effected with unusual rapidity; but if, on the contrary, the pains are moderate, and of short duration, the foetus has time to rally, during the intervals, from the effects of the partial asphyxia which attends each uterine effort, and the cumulative effect of pressure is in a measure avoided. We must, however, even under the most favorable circumstances, look with serious apprehension, as regards the interests of the child, upon all cases of funis presentation, and we would do well to make a point in all such instances of informing the friends of the patient of the precise danger which we anticipate. Many circumstances, other than those already mentioned, modify the danger of individual cases, but, in all, the continuousness and the degree of the

always bound to assume that upon nothing does the issue of the case so much depend as the prolonged retention of the waters. In cases, the termination of which is intrusted to the natural efforts, this is, indeed, of paramount importance; and in all we look upon the danger as imminent only, and not in actual operation, so long as the sac of the membranes prevents the prolapse of the cord. Nothing, therefore, can be more obvious than that we must exercise the greatest possible caution in such manipulations as we may deem necessary, with the view of subjecting the membranes to no such violence as might cause their rupture prematurely. In a word, the preservation of the membranes is, in all cases in which we may be fortunate enough to discover the cord before their rupture, a point of primary importance. For this reason, also, it is far better to leave the presentation in doubt than to run any risk of rupture of the sac in our anxiety to be correct in our diagnosis; and, on the same ground, it stands to reason that no attempt should be made to replace the cord at this particular stage, or even to guide it into those parts of the pelvis at which it will be exposed to least pressure. So long as the waters are retained, we may be confident that the cord is at least under more favorable conditions than could be afforded it by any remedial or operative procedure which we might think proper to adopt. In cases, therefore, in which the bag of the waters occupies the vagina after the termination of what is usually called the first stage, we do not act as we would under ordinary circumstances by rupturing the membranes; but, on the contrary, we look upon the exceptional persistence of the membranes as of good augury in regard to the child in all cases in which we have already recognized the funis. The longer, in fact, the liquor amnii is retained, the shorter will be the final stage during which pressure more or less severe must be encountered; and other things being equal, the less proportionally will be the risk to the life of the child. Persistence of the bag of the waters up to the moment at which the head is being born is perhaps the case of all others in which nature is most likely to secure a happy result. Such cases, however—and along with them may be classed instances in which the capacity of the pelvis is greater than usual—are not frequently met with; but when they do occur we would be quite justified in simply watching the progress of the case, and only interfering when the symptoms become more threatening, or the conditions are such as to render prolonged compression of the cord a matter of certainty.

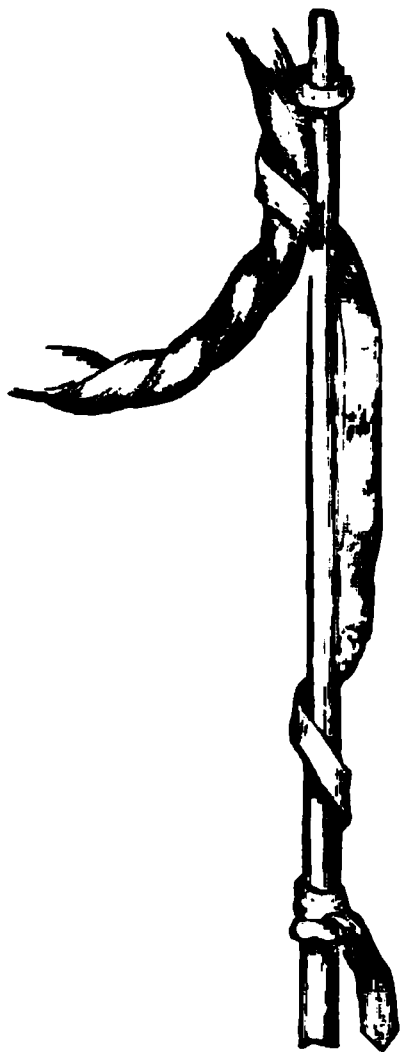
The cases which are of most usual occurrence in practice, and those, too, which are the most favorable in their results, are where the head and the cord present together. In cases in which this complicated presentation has been early recognized, when the membranes are complete and the os as yet but little dilated, it has occasionally been observed that the presenting cord has passed up out of reach, and the head descends alone as in an ordinary case. The possibility of such a satisfactory result would of itself suffice to warrant us in endeavoring, by all means, to preserve the integrity of the membranes, but the result is not, as will be understood, one upon which we can, in any circum-

it upwards, beyond the presenting part, into the cavity of the uterus. The process, when the coil is large, will resemble somewhat the procedure applicable to the reduction of a large hernia, by successively replacing portions of the cord until the whole has been reduced, remembering always that, to be effectual, reduction must be complete, and that, if ever so small a portion be left down, pressure may be as fatal as if we had never attempted the operation. But, with the actual reposition of the cord our difficulties do not cease. The reduction of the prolapse may be easy enough, but the real difficulty consists in maintaining it in its new position. The finger must, on this account, not be hurriedly withdrawn; on the contrary, we should, by continuous support, endeavor to retain it within the cavity until the child descends somewhat farther, and forms, by its presenting part, a plug, which renders impossible, from its bulk, the renewed descent of the funis. The finger should, with this object, be cautiously removed during a pain, when the conditions referred to are, of course, present in the highest possible degree, so that, if the operation is successful, the labor will now be completed without any further risk than attends an ordinary case. For the reasons already stated, success will more frequently attend our efforts when the head of the child presents, as this part more thoroughly fulfils the conditions of an effective plug. Unfortunately, however, in a large proportion of cases, this manœuvre will fail, and the cord will descend again and again, under the impulse of the uterine contractions. It was, probably, this unsatisfactory result which induced some noted authorities to recommend a more thorough method of reposition, by carrying the cord upwards towards the fundus of the womb, and endeavoring to suspend it over the limbs of the child, or at least to press it completely beyond the head, into the hollow formed by the neck. Both of these modes of procedure have been repeatedly resorted to, and sometimes with success; but the difficulties which attend the operation in each case are such that, in the greater number of instances, we will fail utterly in our endeavor to maintain the cord in its improved position.

This acknowledged and, in some instances, insuperable difficulty has given rise to much mechanical ingenuity. The object in view is to devise an instrument by means of which the funis may safely be returned to the upper part of the uterus, and, if necessary, retained there. Of such as have hitherto been invented, those which are the most simple in construction seem to have succeeded best. Michaelis recommended that a large-sized gum-elastic male catheter should be used, to the eye of which the prolapsed cord is attached by a ligature, which is to be loosely drawn so as to avoid compression. The stilet is then introduced, and the catheter, carrying with it the cord, is steadily pushed up in the direction of the fundus, where it may be left, the stilet being withdrawn, until the completion of labor. The contrivance of Dr. Robertson is, with a trifling modification, the same as this. A simple piece of flat whalebone has been preferred by some, and is as simple and as convenient as the other. Perhaps if we were to express a preference for one form over another, that used by Dr. Braun for many years in his *Klinik*

at Vienna might be selected as combining simplicity and efficiency in the highest degree. It is made of gutta-percha, and is used as is shown in the accompanying figure. It is about sixteen inches in length, and

FIG. 127.



Braun's repositorium.

has, about two inches from the rounded extremity, an aperture of sufficient size to allow the passage of a loop of tape or worsted, which, after being carried round the cord, is brought over the extremity of the instrument, and is then pulled so as to grasp the cord firmly without subjecting it to dangerous compression. The apparatus is then pushed as high as is possible in the direction of the fundus uteri, and is allowed to remain until the further descent of the head in the pelvis presents an effectual barrier to the prolapse of the cord. When we are convinced that this stage has been reached, the instrument is to be drawn down with a wriggling or shaking movement, by which the loop passes over the point, and the cord is left behind, while the whole apparatus is removed. Kiwisch effected the same purpose by fixing the point cut from a large catheter upon the extremity of an ordinary uterine sound; and we have tried with success, an instrument made of two parallel pieces of whalebone, of which the one slides upon the other, and has a sort of hook at the end by means of which the cord may be confined or released at will. The principle of

the operation is in every case the same, and the varieties above mentioned are but a few of a large number which practical difficulty has suggested to different operators. We cannot, however, depend even upon the best of them for reliable and satisfactory results, and, in fact, we find that many experienced operators prefer the fingers in all ordinary cases; while Tyler Smith informs us that even Michaelis has abandoned his ingenious instrument for the use of the finger. Be this as it may, we should always try, when the fingers fail, what we can do with a *repositorium*, hastily constructed though it may be from such materials as are at hand. The success attained by others is ample warrant for persevering efforts in this direction.

The *Postural Method* of treatment has from time to time attracted attention during the last thirty years, and is associated chiefly with the names of Bloxam, Thomas of New York, and Dyce of Aberdeen. When this plan is adopted, the woman is placed upon her elbows and knees, so as to raise the pelvis above the level of the fundus uteri, and thus to take advantage of the law of gravity. That a certain amount of advantage is thus gained may be admitted, and it would appear that in practice the results have been in a measure satisfactory. We must not, however, anticipate such results as the supporters of this procedure seem to claim for it. The posture in question will doubtless tend so far to the gravitation of the cord towards the fundus, but it must at the same time cause the head to retreat from the lower segment of the uterus, and thus remove what we are accustomed to regard as

the most effectual barrier to prolapse, for, when a pain comes on, gravity is a mere feather weight in comparison with the power of uterine contraction. This may possibly explain why it has not been attended with more marked success. We should not hesitate to avail ourselves of the postural method in any case of difficulty, and it is quite possible that by combining the instrumental with the postural method as has been suggested by Dr. Barnes, more favorable results may ensue than have hitherto followed the use of either separately.

So long as vigorous pulsation shows that the life of the child is not in immediate danger,—and this we should also ascertain by auscultation of the foetal heart,—we must not cease in our efforts to prevent the cord from descending into the pelvis along with the presenting part. McClintock and Hardy recommend that the woman should be made to lie upon the side opposite to that on which the protrusion has taken place. In addition to the means above detailed, the expedients which have been devised are endless. Among these may be mentioned partial plugging of the uterine orifice, after reposition, by a piece of sponge; and the inclosure of the coil of the funis, when unusually large, within a bag of some kind, the whole being then returned to the uterus and left there.

It is universally admitted that a certain number of cases do occur in which reposition of the cord is a practical impossibility, or would be attended with unwarrantable risk to the mother. Of such a nature are those cases—by no means of unfrequent occurrence—in which the accident is not recognized until the head has already descended far into the pelvis. For the management of such conditions no definite rules can be given; all will depend upon the peculiar circumstances of each individual instance. We must be guided mainly by the following general considerations:

1. We must ascertain whether or not the child lives; for it must be obvious that a negative answer to this question bars all further action on our part. When the cord, therefore, is flaccid and pulseless in the interval between the pains, and the pulsation of the foetal heart cannot be made out, we leave the case absolutely to nature, as we know that there is no danger to the mother, and we need no longer act in the interests of the child.

2. No conceivable circumstances will warrant us in subjecting the mother to any considerable risk. Practically, in an uncomplicated case, she is perfectly safe, so that to endanger her on the mere chance, or even probability, of saving her child, would be worse than absurd. It is, perhaps, true that there is no operative procedure whatever which is not attended with some increase of risk, be it ever so little. But, from a moral as well as a practical point of view, we must draw the distinction between slight and serious risk, and upon this distinction treatment must, in many instances, be based. The principle must, however, remain a general one, for the gradations between the two extremes are infinite, and each case should thus be decided on its own merits, and in full view of the whole facts.

3. When reposition is impossible, the simplest and safest mode of procedure is to guide the cord, as has already been stated, towards that

for more careful consideration and judicious balancing of the special circumstances of individual cases. But it is impossible to lay down rules which might serve, with any approach to accuracy and certainty, as reliable for our guidance. A capacious pelvis, a yielding and moderately dilated os, and other conditions favorable to the operation itself, afford strong presumption that turning may be effected without any great risk to the mother. The period may not have arrived at which the idea of forceps can be entertained, and yet the child is in a state of immediate peril, so that the question may simply be: Are we to act, or to leave the child to its fate? Here, experience, and the habitual caution which matured experience engenders, can be the only safe guides. We repeat, however, our conviction that cases do occasionally occur in which we would be justified in turning at once. We must not forget, while forming our resolution, that the operation does not necessarily, even under the most favorable circumstances, relieve the child from danger. For, the operation being performed, there is still the critical period of the passage of the head, during which, although everything be done which skill can achieve, the child, already enfeebled, may succumb from the renewed pressure on the cord.

CHAPTER XXII.

PREMATURE EXPULSION OF THE OVUM.

CLASSIFICATION—ABORTION; DIFFERENT PERIODS OF—CAUSES: IN GENERAL HEALTH: FROM REFLEX IRRITATION: FROM DISEASES OF THE FUNIS: FROM ACTION OF OXYTOXICS: FROM AFFECTIONS OF NEIGHBORING ORGANS: FROM MECHANICAL VIOLENCE—TENDENCY TO REPEATED ABORTION—SYMPTOMS; AT VARIOUS PERIODS—PRECURSORY SYMPTOMS: PAINS: HEMORRHAGE—TO BE DISTINGUISHED FROM DELAYED MENSTRUATION—SIGNS OF DEATH OF THE FŒTUS—DISTINCTION TO BE DRAWN BETWEEN “THREATENED” AND “INEVITABLE” ABORTION—RETENTION OF THE OVUM—EXPULSION OF THE PLACENTA—TREATMENT: PREVENTIVE: PREVENTION WHEN ABORTION THREATENED—EXPULSION TO BE PROMOTED WHEN INEVITABLE—MANAGEMENT OF HEMORRHAGE, AND OF THE PLACENTA: PLACENTAL FORCEPS—TREATMENT OF A WOMAN AFTER ABORTION—PREMATURE LABOR—SPECIAL CAUSES—TREATMENT.

ALTHOUGH the usual period of utero-gestation is about ten lunar months, the ovum may be expelled at any time by premature uterine action, the result of the operation of certain causes which we shall have to consider. *Abortion*, in the sense now ordinarily attached to the term, is the name which is applied to the occurrence, when it takes place before the eighth lunar month; while *Premature Labor* occurs during the last three months of gestation. Many writers have confined the term “abortion” to the first sixteen weeks, and apply the word *Miscarriage* to the period between that and the twenty-ninth, but it is

them is the alteration in the vascular relations between the maternal and foetal systems, connected with the formation of the placenta.

The *Causes* of abortion must, before we go further, engage our attention. These are very numerous, and, being both general and local, may act in a very variable manner in inducing the premature action of the uterine fibres upon which the expulsion depends. Many obvious causes are to be traced to the general health or temperament of the mother. In so far as the familiar affections which so frequently attend early pregnancy are concerned,—such as sickness, faintness, salivation, and the like,—and which, when extreme, are considered among the diseases of pregnancy, it has always been observed that these are very rarely the cause of abortion. The most common of all,—sickness,—is, even in the worst cases, little liable to be followed by premature expulsion. “It is,” as Dewees says, “a remark as familiar as it is well-grounded, that *very sick women rarely miscarry* ;” and when we see, in some instances, strong and apparently plethoric women miscarry, who have not been sick, we are inclined to share the general impression that sickness is a safeguard, and probably keeps down morbid irritability or rigidity of the uterine fibre. With these exceptions, however, it may be assumed that whatever deteriorates the general health of the mother is apt to produce abortion, or, at least, to place the woman in such a condition that she is more susceptible to the influence of other causes which may then come into play. Any serious disease, whether acute or chronic, may be the direct cause; and the general symptoms which accompany the original disease may be greatly aggravated by the occurrence in question. Many febrile diseases are extremely liable to lead to abortion, more especially small-pox and scarlatina; and in too many of these cases there is a fatal issue. Of chronic diseases, none, perhaps, exercises a more marked influence than syphilis, which actually seems to poison the ovum, and is certainly associated, in many instances, with various forms of disease and degeneration, of which it is the seat. But it is not from the mother alone that such influences proceed; for the ovum may be infected by the poisoned spermatic fluid of the male; and, in some cases stranger still, it would appear as if the woman were a mere conductor of the contagious principle—of which one of the most familiar instances is that which is narrated of his own case by Mauriceau. This distinguished accoucheur tells us that, shortly before he was born, his mother had the misfortune to lose the eldest of her three sons by small-pox, and that in spite of her condition, as women will do, she tended him with constant and tender care. Mauriceau was born the day after his brother’s death, and, although his mother, neither then nor subsequently, presented the slightest symptoms of the disease, he had on his body at his birth, five or six undoubted variolous pustules.

Reflex irritation, from a variety of sources, is one of the most frequent causes of premature expulsion of the ovum. The irritation may start from any part of the alimentary canal, and in those instances the nature of the case may be revealed by the existence of dyspepsia, diarrhoea, dysentery, or intestinal worms. In cases of protracted or injudicious nursing, it may have its origin in the nipple, by irritation of the mammary nerves, as was conclusively shown by Dr. Tyler Smith.

of degeneration. It seems, however, to be clearly proved that it is frequently induced by constitutional syphilis. The decidua, placenta, and other parts of the ovum are, like all other vital textures, liable to congestive and inflammatory affections, which may arrest the vitality of the foetus, either by inducing some of the various forms of degeneration, or by causing sanguineous effusion into the tissue of the placenta, which has occasionally been found to contain purulent deposits. When the blood effused is considerable in quantity, it constitutes what Cruveilhier has described under the name of Apoplexy of the Placenta, which, by interrupting the circulation, may cause death of the foetus, and, consequently, inevitable abortion, although the foetus may be retained in utero for a considerable time, while the degenerated structures of the ovum undergo further change. Any of the numerous diseases to which the foetus is liable may cause its death, and it is believed that twisting or knotting of the cord, either upon itself or round the neck of the child, may have a similar result. Like the placenta, and other tissues of the ovum, the cord too is subject to special diseases, in the course of which its function is destroyed. Besides this, the facts stated by Mauriceau, Stein, and others, seem to prove that the cord when too short may be so dragged upon as to endanger its integrity.

Among the causes of abortion we must not omit to mention those agents to which the name of Oxytoxics has been given. The most familiar of these are the ergot of rye, borax, and savin, which, with some others, exercise an undoubted effect upon the muscular tissue of the uterus. The nature of their action is not thoroughly understood; but it is certain that ergot, and probable that the others exercise a marked influence upon the spinal cord. Through this channel, then, we may infer that the oxytoxic influence passes, which incites the uterus to contraction. The uterus is, however, not nearly so obnoxious to the action of these agents as when the organ is fully distended, either at the end of pregnancy, or from any other cause. A similar action is produced by carbonic acid, as has been abundantly proved by the records of cases of accidental or intentional poisoning. A precisely similar effect follows the retention of carbonic acid in the blood in asphyxia,—a condition under which expulsions of the ovum have very frequently been found to occur. Of the five hundred Arabs who were suffocated in the caves of Dahra, in 1845,—as is said, by the orders of the Duc de Malakoff,—a considerable proportion were women; and of these many who were pregnant were found to have aborted; and other instances of a similar nature have also been recorded. The same fact has been proved experimentally by the researches of Dr. Brown-Séquard, who further believes, as we have already stated, that the oxytoxic action of carbonic acid is the determining cause of labor at the full term, exciting, by the direct contact of venous blood, the irritable uterine fibre to contract. Emotional causes, such as joy, grief, anger, and the like, may produce an effect precisely similar. In some cases of *auto la fé*, and other barbarous acts, in which the victim perished at the stake, abortion has also taken place, partly, as is probable, the result of fear, and partly by the action of asphyxia.

Certain affections of neighboring organs may produce the premature

women, who, so to speak, abort upon the slightest provocation. That in many of those cases of habitual abortion there is some anatomical or physiological cause upon which the phenomenon depends, is more than probable; and in all those instances in which there exists a mechanical impediment of any kind, it may follow impregnation periodically, almost as a matter of course. But putting such aside for the moment, there are other, and by no means rare, instances in which we can only account for the repeated abortions by supposing that the uterus has contracted an inveterate habit. It is, perhaps, one of the most familiar observations in obstetrical practice, that a woman who has previously aborted is much more liable to a repetition of the accident than one who has never been pregnant, or who, if previously pregnant, has carried her children to the full term. And when abortion has occurred in several successive pregnancies, we look upon a recurrence of that condition with some apprehension. In such cases it is very generally observed that the tendency to separation of the ovum is greatest at a certain period of pregnancy; and every accoucheur of any experience can recall cases in which successive ova were thrown off at exactly the same age, as calculated from the presumed period of conception. It would thus seem as if, in those cases in which no obvious cause can be detected, there was some perverted condition of the uterine fibre, as regards irritability, which prevented dilatation of the viscus beyond a certain point, analogous to what obtains in morbid irritability of the bladder, when the desire to micturate occurs long before even moderate distension has taken place. And in the latter case, too, habit has something to do with it, and resisting the call has sometimes, at least, a beneficial effect. In the case of the womb, however, voluntary resistance has no effect, and so the act goes on repeating itself if unchecked.

If those above detailed embrace the chief, they are far from representing all the causes which may possibly lead to premature expulsion. This would require a special treatise. Enough has, however, been said to enable us to apply the principles of treatment, which, without a knowledge of the etiology of the subject, we could by no possibility attain.

Symptoms.—These vary somewhat according to the cause and the period of pregnancy. One of the most constant symptoms of all cases is pain, but in some instances the expulsion seems to be accompanied with little pain or even discomfort. In very early abortions,—the “*Effluxio*” of the ancient writers,—the pain may be no more than that which attends an ordinary menstrual period. The seat of the pain is usually the lumbar, sacral, and hypogastric regions, but it may extend to the groins and down the thighs. A trifling increase in the amount of the catamenial pain, and the presence of some solid masses along with the discharge, may be the only symptoms which attract attention, and are not unnaturally mistaken for those which accompany a delayed menstrual period, when the ordinary functions of the parts are shortly resumed as before. At a more advanced period the symptoms are, as might be expected, more marked. The occurrence is then frequently ushered in by a rigor, followed by an increase of temperature, some

of pregnancy at which abortion occurs, the cavity of the cervix is, as will be remembered, little, if at all, invaded by the process of distension to which the cavity of the uterus proper is subjected. Naturally, therefore, its distension by the uterine efforts is effected under circumstances of comparative mechanical disadvantage. The conditions at least are widely different at the termination of the period of gestation, when the circumference of the external os is the only point against which the uterine efforts are directed ; and, although the dimensions of the body which is to pass are to be taken into consideration, the wonder is that the difficulty of dilatation is not more universally marked. The rupture of the membranes is somewhat irregular in its occurrence, but if these remain intact, they will often be found to protrude in a manner similar to what obtains in labor at a more advanced period. In the course of the first few weeks, the ovum is generally expelled entire, which, indeed, is a most favorable occurrence, and the cause of the fact that the abortions of that period are comparatively free from danger to the mother. When the membranes rupture, the embryo is expelled, and may be followed at a variable interval by the secundines. Or the latter may be retained for a longer period, to give rise to symptoms and difficulties which will require for their management all the skill and judgment which we may have at our command.

As a general rule, the death of the foetus precedes the uterine contractions which cause its expulsion. In other cases, again, the foetus is born in such a condition as would seem to indicate that it had only perished while undergoing the process of expulsion ; and, in a third class, chiefly the result of accidents, it is expelled alive, and may move briskly for a few hours after its birth.

It not unfrequently occurs that the symptoms which indicate the death of the foetus are separated by a considerable interval from those which accompany the expulsive phenomena. When the former, the more important of which have already been detailed, have been distinct and unequivocal, the sequelæ, or external manifestations of abortion, are always to be looked for, usually after an interval of some days. When the woman has received an injury, or has otherwise been subjected to violence, the ovum may, if it be a very early abortion, be expelled almost immediately. If, however, it has attained any size, a certain interval must elapse, when, upon the death of the child, a similar but more gradual result will ensue, the mechanism of the expulsion being essentially the same as in the other cases. It is in the cases in which the cause has been one rapid in its operation that the child is most frequently born alive. Whatever the cause may originally have been, if it acts by first destroying the life of the foetus, the latter plays the part of a foreign body, and as such, excites the uterus to contract. "The living foetus," says Rigby, "obeys the laws of organic life; the dead foetus those of gravity. When once the child has ceased to exist, it acts like any other mass of inanimate matter;" and this too is the reason why the feeling of weight is so frequent, and upon the whole so reliable a symptom in the more advanced periods at which abortion may occur.

The symptoms of abortion call in every case for careful observation

The observations of an intelligent nurse are, of course, of greater value; but we must be cautious even then, as the possibility of hydrorrhœa and discharges from other sources must be admitted and disposed of before we can speak with confidence. If, with discharge of the waters, we have a gaping os, profuse hemorrhage, and obliteration of the cervix uteri, the case may be given up, and our efforts directed into a new channel, with the view of expediting the process which, under more favorable circumstances, it would have been our duty to oppose. With intact membranes, closed os, trifling hemorrhage, and moderate or irregular uterine contractions, our prognosis may be favorable, but is to be expressed with caution, as graver symptoms may at any moment supervene.

In most cases of abortion, the expulsion of the ovum is slow, and it thus happens that the ovum, or a portion of it, is sometimes delayed for days in the orifice of the os. In so far as danger from hemorrhage is concerned, the death of the foetus some time prior to its expulsion is an advantage, as the utero-placental vessels atrophy, and there is thus little danger of hemorrhage—less even than in labor at the full time. Or, if the supply of blood be continued as before, it is misapplied, and results in the morbid development of the parts and the formation of a mole. In some cases, again, the death of the ovum is not followed by its expulsion, but it is retained for many weeks, or even months. At a very early period, the delicate tissues of the embryo are dissolved in the liquor amnii, and are said then to form a gummy solution. At a later period, it shrivels or dries up like a little mummy, and may remain unaltered in this condition during the remainder of its sojourn in the womb. In other cases, it assumes the saponaceous and withered appearance, without any putrefactive odor, so graphically described by Devergie, which is apparently analogous to that variety of putrefactive change which the same eminent medical jurist has described under the name of *adipocere*. In these cases, the woman may experience but little uneasiness, or may be perfectly unconscious of anything unusual. She and her attendants may suppose that the ovum had passed undetected, until, after a long interval, a mass escapes from the vagina, with or without pain, an examination of which at once reveals the nature of the case.

Apart from the danger arising from hemorrhage before abortion, the peculiar circumstances which attend the Expulsion of the Placenta are of the highest importance, and differ in many essential particulars from the corresponding phenomena of labor at the full time. "In all cases, the placenta is retained much longer after the expulsion of the child in abortion, than in labor at the full time." Thus wrote Burns, and his assertion is undoubtedly correct; but we must here make a distinction between the different epochs of abortion. In the first and second month, the placenta being undeveloped, the ovum is generally expelled entire, with little risk to the woman. In the course of the fifth and sixth month, the mode of expulsion of the foetus does not materially differ from what obtains in birth at the full time, except that there is a greater tendency to retention of the placenta and its attendant dangers. It is to the middle term of the abortion period, therefore, that our

solid matters which may escape should be carefully preserved for examination ; but, unfortunately, this is seldom done. We may thus be in no small measure perplexed by the doubt whether the imperfectly formed placenta and embryo, or the placenta alone remain behind. The details which are given by the woman or her attendants must therefore be cautiously received, as quite circumstantial details are sometimes given of the expulsion of the embryo, and yet the issue of the case may show that the presumed ovum can have been nothing but a clot, the layers of which may have appeared to resemble the membranes which inclose the product of conception. Important information is almost always to be derived from a careful inspection of the discharges, and all clots should be washed and carefully examined with a view to the discovery of shreds of membrane, fragments of placenta, or structures which show, more unequivocally still, the nature of the case.

Treatment.—The treatment of abortion may be arranged under two heads: 1st, to prevent it when this is possible ; and, 2d, to favor expulsion when this is inevitable,—under which we may include the management of the placenta.

The Prevention of abortion may, as a practical question, be presented for our consideration under various forms. In the case of the woman who has aborted on several occasions successively, our treatment is, in the strictest sense, preventive, and must be commenced long before actual symptoms of abortion are manifested. In regard to this particular branch of treatment, while there are certain general principles upon which the management of all cases must be based, there are, at the same time special considerations, which must not be lost sight of, as applicable to individual cases. A careful investigation of the causes which may have induced, on former occasions, the premature expulsion of the ovum, will sometimes point to the special considerations alluded to. There is a great tendency, in those cases of repeated abortion, to the separation of the ovum at the same period of gestation. This law operates with great force in cases in which there is no cause in the constitution of the mother, nor disease in the ovum, to which it can be attributed ; so that, in some instances, the uterus actually seems, as it has often been expressed, to have contracted a habit of periodical abortion. The general principles, then, which guide us have their origin in this fact, and the treatment of every case is more or less based upon it. The object is, if it be possible, to tide over the period of former abortions ; and, when this can be successfully effected, the pregnancy will often progress, and reach the full time, without the occurrence of a single bad symptom. If we can only succeed in breaking the habit,—be the ultimate result of the pregnancy what it may,—we have achieved something in the way of success ; and we have known more than one instance in which the result of treatment was, in the first place, to transfer the period of abortion from the third to the fifth month, and on the occasion of the next pregnancy, a repetition of the same treatment was attended with the most satisfactory results possible.

In effecting our object, in the circumstances now under consideration, rest must be placed first among the remedial agencies in which we may trust. The strictness with which we enjoin rest will depend, in a great

by inhalations of oxygen, or by the exhibition of such substances as contain a large proportion of oxygen in a state of feeble combination. It was with this object that Dr. Bower prescribed nitric acid, and Sir James Simpson the chlorate of potash. In the case of other diseases of the ovum or foetus, such as meningitis or peritonitis, mercury and other drugs have been prescribed on an analogous principle, in the hope of affecting the foetus through the maternal circulation, but so many difficulties are in the way of correct diagnosis in such cases that little can be hoped for in the way of successful treatment. Indeed, with the single exception of the treatment of syphilis by mercury, we can place but little reliance on the medicinal treatment of habitual abortion, beyond what is administered with the view of giving tone to the system, or allaying constitutional disturbance. We must not, however, even where nature seems to defy us, in any case despair of success. Dr. Young, of Edinburgh, tells in his lectures of a case in which the patient actually miscarried thirteen times, and yet bore a living child the fourteenth time. In the most obstinate cases, a year's marital separation should be enjoined.

The prevention of abortion extends, although in a somewhat different sense, to the treatment of cases in which the symptoms of impending abortion have already manifested themselves. Having taken due cognizance of the symptoms which enable us to decide whether or not the loss of the ovum is inevitable, and being persuaded that there is room for hope, the efforts of the accoucheur will chiefly be directed to the expulsive contractions of the uterus. The success of his treatment will in fact depend upon the power which the remedies he may employ will exercise upon this function of the uterus. Should any source of irritation exist, he must at once attempt to remove or to allay it. Bloodletting was at one time very generally employed in all cases, but is applicable only to those in which there is great arterial excitement, and a tendency to plethora; but in these days few practitioners would risk more than a few leeches to the perineum, and even that under very exceptional circumstances. The most perfect quiet of body and mind is more important perhaps than anything else. The patient should lie on her back on a hard mattress, and be kept cool. She should change her position as seldom as possible, for any exertion, however slight, will often be attended with a gush of blood. Her food should be light and easy of digestion; and not only stimulants, but animal food should in most instances be forbidden to her. Hemorrhage is one of the alarming symptoms which we desire to arrest if it be possible, and on this account it is well to give the food cold, or at least cool. Caution must, however, be exercised in the use of ice, either internally or externally, for if, as is sometimes done, all the food is iced, and, in addition, cold affusion and injection is resorted to, we may excite reflex action of the uterus, and thus defeat our ultimate object, although we may arrest the hemorrhage. With the view of arresting uterine action, nothing can be compared with opium, which is, indeed, our sheet anchor. This has succeeded even in cases where the discharge was alarming, and the os open to a considerable extent. To secure the full advantage of its sedative action, it must be given in full doses, so

that forty minims of the *Liquor Opii Sedativus* in two doses, at an interval of twenty minutes, may be given in most cases without the slightest hesitation. This preparation has, we believe, the advantage which Rigby claimed for it over the other preparations of opium, that its sedative effect is more sure, and that it produces less irritation and derangement of the stomach and bowels. In other cases, again, in which it may be unadvisable to give opium by the mouth, an ordinary enema of starch, with a drachm of laudanum, will be preferred; and in point of fact, the possibility of having a local in addition to a constitutional effect, when it is administered in this way, will probably cause many to make choice of the method. Cazeaux recommends, in addition to this, dry cupping and irritant revulsives to the upper part of the trunk. We must never despair so long as a chance remains of saving the ovum, bearing in mind that evidence of the death of the foetus is an immediate warrant for suspending all operations which have for their object the retention of the product of conception. It is a safe and good rule, however, that so long as we are not sure that the foetus is dead, we should act as if it were living.

When violent pains, profuse hemorrhage, discharge of the liquor amnii, and progressive dilatation of the os, show that abortion is inevitable, the treatment differs widely from the above, as the object of it now is to promote instead of to prevent expulsion. In the course of this process, however, there are so many steps to be gone through, that it often requires great nicety and discrimination to conduct a case to a successful issue, which implies the safety and speedy recovery of the mother. In the first three months the less we interfere the better. For, in these instances, as has been seen, the ovum often escapes entire, which is the most favorable occurrence possible; while, if we interfere too much by manipulation in the progress of such a case, we run the risk of rupturing the membranes, discharging the liquor amnii, and thus causing a protracted retention of the whole or part of the ovum. The only symptom which is likely even thus early to call for energetic treatment is hemorrhage. It is unusual at this period for the loss of blood to be a cause of much danger or alarm; but, if it should be so, we should not hesitate to plug the vagina. Of the various modes of plugging the vagina, none is more simple or more effective than that which is recommended by Dr. Dewees. He advises that a piece of soft sponge, of sufficient size to fill the vagina without producing uneasiness, should be wrung out of pretty sharp vinegar, and introduced into the passage up to the os uteri: the blood in filling the cells of the sponge coagulates rapidly, and forms a firm clot, which completely seals up the vagina without producing any of those unpleasant effects which follow upon the insertion of a napkin rolled up for that purpose. There is this to be said in reference to the action of the plug, that while it may be looked upon as universally applicable in all cases of alarming hemorrhage, when all hope of saving the ovum has been abandoned, we should, if possible, avoid it in all other cases. It is an undoubted source of reflex contraction, and may thus precipitate labor in a hopeful case. If properly applied, the plug may be left for a considerable time without interference, and may often be expelled

with the ovum. If removed, and the hemorrhage continues while the os is still contracted, there is no course open to us but to renew the plug, and this may always be done with the less hesitation, as it is well known that the risk of internal hemorrhage during the period of abortion is very trifling, and has rarely been observed earlier than the sixth month.

As in the case of other hemorrhages, astringents are frequently given in abortion, and often with good effect. It is, however, in the earlier abortions in which this is most marked, when acetate of lead, gallic acid, and the mineral acids, may often be given with advantage. The more advanced the pregnancy, the less can we rely on ordinary astringents; so that we must then resort to oxytoxics, with the view of exciting uterine contraction of such force as may expel the ovum, or such portion of it as may be retained. A simple enema, or one containing turpentine, will often serve as a powerful incentive to uterine action. If the abortion is one of the sixth month, we may sometimes be justified, when the hemorrhage is alarming, in rupturing the membranes, as in an ordinary case of accidental hemorrhage towards the end of pregnancy—a mode of treatment which was recommended by Puzos. More probably, even then, we would make choice of plugging, in preference to a mode of procedure which must even further remove any small chance of saving the ovum which might exist.

It is the Expulsion of the Placenta, however, in regard to which the greatest difficulty is often incurred. If that period of pregnancy has been reached at which this organ is distinct, the main difficulty would seem to arise from the firm anatomical connection which subsists between the uterus on the one hand, and the placenta on the other. If, therefore, the whole ovum is not expelled entire, as is usual in the early weeks, the effect of the uterine contractions will probably be to rupture the membranes, and discharge the embryo or foetus through the cervix, which has been sufficiently dilated for this purpose. The action then ceases, the os closes, and the placenta is retained; so that here the analogy between abortion and labor at the full time ceases.

This being the state of matters, we can do nothing but wait. The contracted state of the os prevents the introduction of the finger, and ergot is often of little or no use; so that, unless the hemorrhage is alarming, the safest course is to preserve an expectant attitude. When, after an interval of hours or days, as the case may be, hemorrhage recurs, with pains more or less distinct, indicating further separation of the placenta and renewed uterine effort, we must carefully observe the symptoms which are being developed, and manage the case accordingly. The hemorrhage may be so profuse as to require the plug, while we wait for the dilatation of the os. While this process is slowly being effected, we may find that a portion of the placenta occupies the cervix, and can already be reached with the finger. Great caution should here be exercised; and, if the hemorrhage is not alarming, it may be set down as a rule that we should abstain from interference until there is some clear evidence of entire separation of the placenta, or until the os has reached a stage of more advanced dilatation; and, even then, should all be going on favorably, it will be better to leave

risk to the mother, and the cases in which her life is placed in jeopardy are, therefore, relatively of rare occurrence. Without taking into consideration the numerous instances in which abortion occurs, and is never recognized as such, this termination of pregnancy is of such frequent occurrence that the difficulties and dangers above described are only too familiar to the busy practitioner. Dr. Whitehead of Manchester made this a point of special investigation, and found that out of two thousand pregnant women, who had applied to the Manchester Lying-in Hospital, the total number of their abortions amounted collectively to one thousand two hundred and twenty-two. Thirty-seven out of every two hundred mothers had aborted before they had reached the age of thirty, and among those of a more advanced age the proportion of abortions was very much higher. It is, in point of fact, a rare thing for a woman to pass the greater part of the childbearing epoch in wedlock, without having aborted once, or oftener,—which, along with the facts above cited, will suffice to show how enormous must be the loss of foetal life in the aggregate.

The treatment after abortion is a question of considerable importance, but, unfortunately, it is often a difficult matter to persuade a woman of the necessity which exists for the exercise of ordinary prudence and care. Under favorable circumstances, all that may be necessary is confinement to bed for a few days, and avoidance of fatigue and exertion for some time thereafter; but, in other cases, more strict treatment may be necessary. Should retained fragments of placenta give rise again to hemorrhage, the patient must not be permitted to rise until all trace of this has ceased; and, if her general health has materially suffered, a course of chalybeate tonics, change of air, tepid sea-baths, and the like, must be resorted to, with a view of restoring the health. The great danger accruing from neglect of these precautions is not so much to be evinced in immediate effect as in the more remote results; and we are convinced, from long experience, that no more fruitful source of menstrual disorder or of chronic uterine disease exists, than what arises from a want of due precaution at this critical period of a woman's existence.

But little of a special nature remains to be said of Premature Labor, which occurs only during the last three months of gestation,—at a period, therefore, at which the child is held to be “viable.” A vulgar idea very generally prevails, that children born at the eighth month are reared with more difficulty than those which are prematurely expelled at the seventh; but careful observation has clearly shown, what reason and analogy would have led us to conclude, that the further removed from the natural term of pregnancy is the period of delivery, the less chance is there of rearing the child. Many of the causes which have been enumerated as inducing abortion may also operate similarly at this more advanced period of pregnancy, but there are undoubtedly other special causes which may also be mentioned. The most important of these latter is overdistension of the womb, from whatever cause this may arise. Plural pregnancy, dropsy of the amnion, and hydorrhœa, are all causes of this nature; and the immediate result of their operation is that the uterus attains, at a period much earlier than

ago, divided cases of hemorrhage which occur in the last three months of gestation into those which are "unavoidable" and those which are "accidental." Of the two, the former is the more important, and is familiarly known under the name of Placenta Prævia; while the accidental form is due to the operation of causes which are similar in their nature, and in their mechanism, to the discharges which occur in abortion.

Placenta Prævia, or Placental Presentation, as it has also with perfect justice been termed, implies that the placenta, instead of occupying its usual site in the neighborhood of the fundus uteri, is the lowest or most dependent part of the uterine contents, and occupies, wholly or partly, the passage through which the child has to pass. When it is attached to the entire circumference of the cervix, it is called "complete" placenta prævia, or Placenta Centralis; while, if it is adherent to a portion only of this area, it is usually designated as "partial" placenta prævia or Placenta Lateralis. Such peculiar situation of the placenta necessarily involves its detachment from the subjacent uterine tissues with which it is in contact. This may take place, either gradually, in proportion as the cervix expands in the latter months of pregnancy, or, more suddenly, when the mechanism of the first stage of labor tears asunder those attachments in the course of the uterine contractions which effect dilatation of the os. In either case, the hemorrhage from gaping vessels is in the strictest sense of the term "unavoidable," as it is impossible for the child to be born without hemorrhage of the most alarming description. There are, on this account, few of the dangers of midwifery which the accoucheur dreads more than this; and Nægele was probably right when he said that "there is no error in nature to be compared with this, for the very action which she uses to bring the child into the world is that by which she destroys both it and the mother."

The idea entertained by the ancients, and which (with the exception of those of Portal and Gifford) was taught in all works on midwifery down to about 1766,—when Rœderer's "*Elementa Artis Obstetriciæ*" was published—was that in these cases the placenta was originally attached at its usual site, and that it only fell down to the lower part of the uterus after it had been entirely separated. Rœderer, in the work above referred to, gave as complete and succinct a description of placental presentation as is to be found in any modern work on obstetrics, and drew, moreover, a distinction between central and lateral implantation of the placenta. The work of Rigby, published a few years later, but which contains no reference whatever to the observations of Rœderer, is more familiar to English writers, and certainly was the first to bring a correct knowledge of the subject under the notice of English obstetricians, whatever may be the weight of the author's claims to originality.

The *Causes* of placental presentation are but little understood. The fertilized ovum grafts itself, as is well known, generally, upon some portion of the uterine mucous membrane, not far distant from the orifice of the Fallopian tube along which it has descended. It has been presumed that, as the connection between the chorion and the decidua is,

be slight, and, under favorable circumstances and judicious treatment, will speedily cease. After an uncertain interval, and often at what would have been the next menstrual period, the symptoms will, however, return with increased violence. Repeated hemorrhages of this kind, becoming progressively more alarming, ultimately attract attention, and call for assistance. The loss of blood in these cases probably depends upon the gradual development of the cavity of the cervix, which becomes further encroached upon with every day of advancing pregnancy.

If at this stage we make an examination, we shall probably find that the os and cervix are somewhat peculiar to the touch. This peculiarity consists in a doughy feeling, which is due to the unusual thickness of the cervix, which is necessarily permeated with large vessels for the placental circulation. And this feeling is further exaggerated by the presence of the placenta itself, between the finger and the presenting part, depriving the latter of its feeling of firmness and resistance. If the os is sufficiently dilated to permit the passage of the finger, the characteristic spongy tissue of the placenta may alone be felt; or, if the case should be a lateral and not a central one, we may feel the edge of the placenta projecting at one side of the os uteri, and, possibly, the bag of membranes with the presenting part of the child at the other. If the flooding has been very severe, we may feel the detached surface of the placenta, which is lacerated and stringy to the touch; and we may even discover, in some instances, where the separation has been extensive, a portion of the organ protruding into the os or through it, into the vagina. In presentations of the breech or shoulder, which usually remain high in the pelvis, the detection of placenta prævia is more difficult, partly on this account, and partly because the placenta can less easily be felt than when it is between the finger and the resistant structures of the cranium.

There is another class of cases, in which no symptoms whatever occur until the uterine contractions at the commencement of labor interrupt, for the first time, the continuity of the utero-placental vessels. Here the gush of blood is sometimes so fearful, as to cause immediate syncope, and in some cases the death of the woman before assistance can reach her. Hemorrhage before labor, therefore, has this advantage,—that it enables us to recognize the nature of the case at a period sufficiently early to adopt precautionary measures, with a view to the patient's safety. From the commencement of labor, the symptoms in the two varieties are identical. Each successive pain tends still further to the separation of the placenta from its cervical attachments, and consequently to increase the hemorrhage, so that, up to a certain stage, the more advanced the labor, the more imminent is the danger; and, if left to themselves, such cases almost necessarily prove fatal. It is here that the important practical distinction is drawn which enables us, even without a digital examination, to distinguish between Unavoidable and Accidental hemorrhage, and which led Rigby to adopt this useful classification. In the former, remissions may occur between the pains, but with each contraction the flow of blood is increased; while, in the latter, the descent of the head bars the egress of blood, the

place intermediate between the "unavoidable" and "accidental" category. As is the case with regard to many other of the accidents of midwifery, there seems to be a proclivity to the recurrence of placenta prævia in those who have once been the subject of it; and another and stranger fact has also been noticed by Rigby, Saxtorph, Naegele, and others, viz., that at certain periods this accident seems of more frequent occurrence than at others. The last-named authority, in remarking on this, states "that in some years, placental presentation was so frequent that it seemed as if it were almost epidemic."

Treatment.—The occurrence of hemorrhage in the last months of pregnancy is of itself sufficient to warrant, and indeed demands, an immediate vaginal examination. Should the existence of the symptoms already detailed reveal the presence of the placenta at the os, the future management of the case becomes at once a matter involving no little anxiety. It has already been remarked that the earlier the period of pregnancy at which flooding first takes place, the less is the immediate risk. The treatment of such cases differs but little, as Rigby well remarks, from that of an ordinary case of abortion. The indications, in fact, are the same,—viz., to stop the discharge, and allay any disposition to uterine contraction. At the same time, no effort must be spared to prevent, if it be practicable, any further separation of the placenta.

Nothing is, perhaps, of such importance as rest. The patient should be placed in a bed which is as hard as is compatible with comfort. With the view of keeping her cool, the temperature of the room must be attended to, and the bedclothes should be light. The bowels may be managed by gentle saline laxatives or enemata, and the patient should not be permitted to raise her shoulders; nor, for a certain time after an attack, should she ever be allowed even to move in bed more than is absolutely necessary. The food at first should be of the lightest possible description, such as milk, arrowroot, and the like, and should be given cool. Such restricted regimen cannot be persevered in for any length of time, so that we must soon introduce soups, fish, chicken, and more nourishing material generally, into the dietary. The use of stimulants, except in so far as they may be necessary in the stage of depression, consequent on severe flooding, must be forbidden. Under such treatment, and with the mind as well as the body at perfect rest, the best chance is afforded the woman of reaching the full term of gestation. The probable result of hemorrhage, in placenta prævia prior to the seventh month, is, as has been said, abortion. But, when gestation is further advanced, and the foetus has reached the period of viability, we endeavor to avert premature delivery as long as is possible, in order to give the child the best possible chance. But we do this in the interest of the mother also, and not exclusively in that of the child. Of the operative remedial measures which may be adopted, none is so frequently resorted to as turning, and the nature of the operation is such that it may always be effected with greater ease to the operator, and less risk to the woman, the nearer the case is to the full term.

When hemorrhage and vaginal examination have revealed the nature of the case, at any time during the last three months of gestation, we

the termination of pregnancy, or when, at any period, the hemorrhage is so profuse, and the general symptoms so urgent as to demand energetic action in the presence of a great emergency, our duty is to encourage contraction, and to complete delivery as soon as possible. With this object prominently in view, various modes of treatment have been recommended, to each of which it is necessary specially to advert. In a large proportion of the cases in which the os is as yet undilated to any extent, the only justifiable mode of procedure is to arrest the hemorrhage by plugging, and, at the same time, to favor uterine contraction by every means at our command. Plugging is, however, as will be observed, in all cases of placenta prævia, a mere temporary expedient, which is employed with a view to ulterior proceedings.

The evacuation of the liquor amnii by puncture of the membranes is a practice of great antiquity. The object of this in the present instance is to develop uterine energy, which usually becomes increased when its walls are thus relaxed; while, at the same time, being of smaller bulk, it acts with greater energy. The cases to which this mode of procedure seems more particularly applicable, are those instances in which the placenta is situated more or less laterally, or, in other words, those in which the membranes can be reached before the os has become dilated, and without much risk of rupture of tissue. Its use, however, has not been confined to such cases, but has been recommended and practiced by Deventer, Deleurye, Smellie, and, more recently, by others, who, in cases of central implantation, punctured the placenta by a trochar or otherwise, with the result of arresting the hemorrhage. Rupture of the membranes is also applicable to all cases in which it is found expedient to induce premature labor, that is to say, if it can be effected with safety; but, if not, of course other means must be adopted to rouse the uterus to activity. Dr. Barnes says, "The puncture of the membranes is the first thing to be done in all cases of flooding sufficient to cause anxiety before labor. *It is the most generally efficacious remedy, and it can always be applied.*" The italics are his, indicating the emphasis with which he makes the statement, but in so far as our experience enables us to judge, we cannot indorse his assertion. And, moreover, we cannot but think that such a procedure as he describes of guiding a stilet or quill along the finger to the membranes must necessarily cause, for a time at least, an increase in the bleeding in central cases, as it certainly must a complete and violent separation of the placenta in a part of its circumference. The contraction of the uterus may be further promoted by the action of ergot and the other oxytoxics. Evacuation of the liquor amnii and the use of ergot are, it must be remembered, open to this objection, that, by such treatment, the difficulty of the operation of turning is greatly increased, should that operation eventually be found necessary; but, if the operation for separation of the placenta is to be preferred, as is recommended by Dr. Barnes, this objection has no force.

The operation of turning, which will be more particularly described in another chapter, is that to which most modern authorities, with some distinguished exceptions, give the preference in the treatment of cases of placental presentation. So long as this operation is looked forward

ascertained, when the fingers are thrust through them, the feet seized, and the operation completed in the usual way. During the course of this procedure—which is often easier of execution than under ordinary circumstances, owing to the relaxed state of the uterus, the result of hemorrhage—the arm of the operator acts as a plug, which effectually restrains external hemorrhage. When the feet are brought down into the vagina, the breech and trunk of the child forcibly compress the placental mass; and in this way one plug is replaced by another more efficient still. The action of the womb should be aided by an external bandage, or by firm pressure, at this period, over the fundus, and a full dose of ergot may be administered, with the view still further of insuring efficient contraction. If the child is still alive, or if there is no evidence of its death (in which case we should act as if it were alive), delivery must be effected as rapidly as is consistent with the safety of the mother. With its birth the critical period of danger will have passed, and the uterus will now contract firmly upon and shortly expel the mass of the placenta which is left behind.

When the accoucheur is summoned at the commencement of labor, on account of the alarming flooding, he will probably find that the os is not sufficiently dilated to permit of the operation of turning with a reasonable prospect of safety. His first duty at this stage is to arrest the hemorrhage, until such time shall arrive as the condition of the parts may warrant him in proceeding to the operation. This can only be effected by the action of the plug, which is to be introduced in the manner above described. Or, what is more effectual still, strips of lint may be introduced, one after the other, through the speculum, as by this means the vagina can be more thoroughly packed. As the pressure of the plug is apt to interfere with the action of the bladder, it will be well to see that that viscus is empty before its introduction. A still more effectual method of plugging may at this stage be practiced by means of the fiddle-shaped water-bags, which we owe to the ingenuity of Dr. Barnes. A certain amount of dilatation is necessary for the successful application of these; but if the os is of sufficient size to admit the point of the finger, it will then be practicable to pass a bag of small size. This may then be distended with water in the manner described by the inventor, and a firm elastic plug is thus formed, which serves the double purpose of preventing any escape of blood, and at the same time of mechanically dilating the os by a safe and graduated method of pressure. The exchange of the small bag for one of larger size may, after an hour or so, be effected without much risk, if the operator is dexterous; and in this way such dilatation of the os may be effected as will admit the passage of the fingers, and subsequently of the hand. But whether we make use of the vaginal or cervical plug, the object is to dilate the os, with the view of subsequent operative procedure.

It is to be remembered that extensive dilatation of the os is by no means essential to the successful performance of the operation of turning. The method of combined external and internal manipulation, which has already been referred to in the chapter on Transverse Presentations, and which will be more particularly described, affords a

mode of procedure which is by no means difficult, and which is certainly safer to the mother. To effect this, the passage of one or two fingers through the os is all that is necessary; and, in so far as placenta prævia is concerned, we are convinced that this method is, for other reasons, peculiarly applicable.

"The conditions favorable for turning are," says Dr. Tyler Smith, "a dilated or dilatable state of the os uteri; the retention of the liquor amnii, or a moderately relaxed state of the uterus; a pelvis of average capacity; the absence of dangerous exhaustion, or a temporary cessation of the hemorrhage." Nothing is of greater importance than that the operation should be attempted as early as possible, for there can be no doubt that the great mortality which attends these cases is due, in no small degree, to an injudicious expectant treatment, while the precious moments pass during which alone we can save the patient's life and that of her child. It may sometimes be necessary, when the case does not come under observation until this more advanced and critical stage, to delay the operation, and to plug, until the woman is rallied by free stimulation from the state of incipient collapse into which she has fallen. In this, as in all other cases of prostration from hemorrhage, brandy given along with opium will effect the object in view as well perhaps as any other combination of stimulants which it is possible to prescribe. When, in such cases, the pulse and general appearance show that the woman has rallied, the operation may be commenced, and conducted with the special precautions which the circumstances demand.

In some cases of partial placenta prævia, the operation of turning may not be required; but if in such the hemorrhage is still alarming, after the head has descended so as to occupy a fully distended os, the labor may be completed by the application of the forceps.

Artificial Extraction, and Artificial Separation of the Placenta—for it is proper to draw a distinction between the two—are operations which were suggested by what has occasionally been observed as a natural termination of placenta prævia, viz., the birth of the placenta or its expulsion into the vagina in advance of the child, *with cessation of the hemorrhage*. Imitating this Drs. Wood, Radford, and Simpson, tried what had previously been done in a few cases, to separate and extract the placenta, in the hope of speedily arresting the hemorrhage, and thus insuring the safety of the mother. Simpson, with his usual and indefatigable industry, collated a table, in which cases are given showing the results to the mother in instances of turning. Contrasted with this, is another series of cases, in which the placenta was expelled naturally or removed artificially before the birth of the child. The following represents, in a tabular form, the results of his elaborate statistics:

	Cases.	Maternal Deaths.
Turning.	654	180, or 27.48 per cent.
Extraction or Expulsion,	140	10, or 7.14 per cent.

Such a result as is represented by these figures is by no means, however, a fair representation of the comparative risk attendant upon the two operations. On the contrary, by grouping together the cases in

which natural expulsion had occurred with those in which the removal had been accomplished by operative interference, the value of the comparison is lost, as it must be evident that expulsion is less likely to be attended with a fatal result than those cases in which the parts are torn asunder by an operation which, however gently performed, implies a rupture of tissue by violence, involving the integrity of large vascular trunks. Although the figures are thus quite unreliable, it must be admitted that the cases upon which they are founded show quite clearly that separation of the placenta, whether natural or artificial, is accompanied in a large proportion of cases with an abatement, dependent upon the arrest of hemorrhage, of the more alarming symptoms. "Paradoxical as it may appear," says Simpson, "there are sufficient grounds and facts for believing that, when the placenta is separated slightly and partially, the chance of fatal hemorrhage to the mother is greater than when the disunion of the organs is entire and complete."

It would serve no good purpose to follow the discussion to which Simpson's views as to the source of the hemorrhage in placenta prævia gave rise. These are essentially the same as were held by his predecessor, Dr. Hamilton, that the blood flowed not from the uterine, but from the placental orifices of the ruptured vessels, a point which, although of high physiological interest, must not divert our attention from the more important practical questions upon which it has but little direct bearing. We must not omit to mention that the result of the operation of extraction is, as regards the child, extremely unfavorable in its results—more so, certainly, than turning, if performed at the proper time. In this, also, Simpson's statistics are likely to mislead, if not carefully analyzed. Again grouping together indiscriminately cases of expulsion and extraction, he finds that in 141 cases, the child was saved in 33, and, as the result as regards the child was not stated in a considerable number of the remaining cases, it may be assumed that the actual number of children born alive was somewhat larger than is above stated. But here again the same source of fallacy comes into play, and, in point of fact, it may be assumed that the statistical results of spontaneous expulsion and artificial extraction should be carefully separated, otherwise the figures are very apt to encourage errors in practice. When the fœtus is born by the efforts of nature, it has often been found to be expelled by the same pain which brings the placenta into the world, or at least follows it within a very few minutes, a result extremely improbable in artificial extraction. Dr. Simpson's own tables point conclusively to this fact, and in those cases in which the interval between the birth of the placenta and that of the child was more than ten minutes, he gives but one instance occurring in the practice of Mr. Perfect, in which the child was born alive. Unless then it could be proved that a speedy delivery of the child could be depended upon after extraction of the placenta, that operation cannot be looked upon with favor, in so far at least as the interests of the child are concerned.

But, should we even resolve upon the operation of extraction, the difficulties of the case do not terminate with the completion of that operation. Thus we find that, of the entire number of 86 cases given

by Simpson in his tables, delivery was effected by turning in 25 instances, and by other modes of operative procedure in 7, while in 9 the mode of delivery is not specified. This leaves 45 cases only in which the delivery was completed by the natural pains, and we may confidently conclude that, if we could separate the cases of spontaneous expulsion, the issue of the operative cases would appear still more unfavorable. The inference which was drawn from Simpson's elaborate papers on this subject, and the interpretation which indeed seemed to attach to them, was that the author wished to supersede the old operation of turning by that of artificial separation. We might think it necessary to say something more in refutation of such a conclusion, were it not that the practice has never commanded general support, save under exceptional circumstances. And, moreover, a careful reperusal of Simpson's facts, arguments, and conclusions, seems very clearly to show that, whatever opinions may have been entertained by that distinguished accoucheur when he submitted his views to the Medico-Chirurgical Society of Edinburgh in 1844, those were materially altered before his death. This appears even more clearly from the "Lecture Notes," by which the reprint of his selected obstetrical works recently edited by Dr. J. Watt Black is prefaced.

We shall now refer to the mode of partial separation which has of late years received a considerable amount of support. It is intimately associated with the name of Dr. Barnes, whose writings on the subject of placenta prævia are among the most valuable of the many contributions to obstetrical literature which we owe to the distinguished obstetric physician of St. Thomas's Hospital. The effect of the uterine contractions, and consequent dilatation of the os is, as he has shown, to separate the placenta in concentric rings from below upwards, vessel after vessel being thus opened, and the hemorrhage proportionally increased. So soon as the separation has reached a certain height, the passage of the head may become possible, while yet a sufficient amount of placenta may remain attached. Dr. Barnes maintains that the complete separation of the placenta as recommended by Simpson is impracticable. "In by far the greater number of cases," he says, "the placenta extends higher than the meridian of the uterus, often reaching the fundus. The fingers are not long enough to reach even half way towards the further margin of the placenta. The diameter of the placenta is nine or ten inches; the fingers will barely reach three inches. In the greater number of cases, therefore, in which the directions prescribed have been followed, the placenta has not been wholly detached, and the result, when successful, cannot be attributed to an operation which was not performed." Assuming this fact to be correct, and supposing, therefore, that to insure *complete* separation of the placenta, the whole hand must be passed into the uterus, he adds that this operation "is even more severe than turning, which does not require the hand to be passed through the cervix." Here he obviously refers to the bipolar method. There is, he infers, a zone or line around the lower part of the uterine cavity, *above* which spontaneous detachment and hemorrhage do not occur, and *below* which alone separation and unavoidable hemorrhage take place.

On this hypothesis, then, the real period of danger is that during which the placenta is being separated from the cervical zone, and Dr. Barnes maintains with great confidence that this is the mode of action in many of the cases which have been narrated of spontaneous cessation of the flooding, the real facts being misinterpreted by the observer. In a case which recently occurred in the experience of the writer, the facts observed seemed strongly to corroborate the idea thus suggested, in regard to which he had previously been more than skeptical. A young woman, pregnant for the second time, had had several attacks of hemorrhage prior to the expiry of her pregnancy. With the first labor pains another gush took place, and shortly after this she was first seen and examined by him. He found the os sufficiently dilated to admit a single finger, and the placenta completely surrounding the orifice. During several successive pains it was observed that the quantity of blood was for such a case very trifling, and it was on that account resolved to leave the case for a time to nature, with the view of observing what course nature would adopt. Materials were prepared for plugging the moment this should seem to be necessary, and the case was anxiously watched. Soon afterwards pains came on of great violence, and in rapid succession, but there was only one short period of about a minute and a half, during which the hemorrhage was alarming, which suddenly ceased upon the rupture of the membranes. Upon an examination the head was now felt descending, and the woman was shortly afterwards safely delivered of a living child. She made an excellent recovery.

Whatever may be the method of treatment upon which it is resolved to act, the first difficulty generally is to effect the dilatation of the cervix with the least possible chance of hemorrhage. Dr. Barnes, believing that the tardy separation of the placenta from what he terms the "orificial zone" of the uterus is the main cause of hemorrhage, recommends that, if rupture of the membranes, which is his first procedure, should fail, we ought at once to separate the whole of that part of the placenta which is adherent to the zone in question. The details which he gives are as follows: "Pass one or two fingers as far as they will go through the os uteri, the hand being passed into the vagina if necessary; feeling the placenta, insinuate the finger between it and the uterine wall; sweep the finger round in a circle, so as to separate the placenta as far as the finger can reach; if you feel the edge of the placenta where the membranes begin, tear open the membranes freely, especially if these have not been previously ruptured; ascertain if you can what is the presentation of the child before withdrawing your hand. Commonly some amount of retraction of the cervix takes place after this operation, and *often the hemorrhage ceases.* . . . If uterine action return so as to drive down the head, it is pretty certain there will be no more hemorrhage; you may leave nature to expand the cervix, and to complete the delivery. The labor, freed from the placental complication, has become natural." Failing this, he then advocates the use of his hydrostatic dilators, which at once dilate the os, and arrest the bleeding. These bags, which we have had occasion repeatedly to use, and which we have ventured to suggest as applicable to the plug-

as it is usually performed. The risk, however, has been greatly modified by the introduction of the bipolar method of version.

The so-called *Accidental Hemorrhage* differs in many essential particulars from the unavoidable variety commonly called placenta prævia. The designation is, of course, more an arbitrary than a philosophical one; but as it is one generally intelligible to English readers, we shall not attempt to change it. In this case, also, there is hemorrhage before delivery, but there is a most important clinical distinction to be drawn between the two. In the last three months of pregnancy the anatomical connection which subsists between the uterus and the placenta becomes more feeble, so that the one is more easily separated from the other. The wonder then is, not that the separation does in rare instances occur, but that it does not occur more frequently. In accidental hemorrhage, the placenta is attached to the uterus at its normal site.

What the Causes are which, in such circumstances, lead to a separation of the placenta are but little known or understood, but it has been observed that the separation rarely occurs in the young and robust; while, in those who have borne many children, or in whom any cause may have led to constitutional feebleness, it is relatively of more frequent occurrence. If, in such cases, the flooding is to be looked upon as a symptom of constitutional depravity, that of itself renders the case a grave one; but another source of hidden danger is that the hemorrhage is often concealed. Placental separation indeed occurs; blood is insinuated between the membranes and the uterus; obvious shock and even collapse is produced; and yet no single drop of blood escapes externally, while laceration of the uterine wall has occurred from the over-distension of the cavity by a hemorrhage such as this. In other cases, again, the placenta has remained adherent at its margin, while an enormous quantity of blood has been effused between the uterine wall and the body of the placenta. It would appear that, in many cases, the separation of the placenta takes place in the centre and not at the margin, and that the blood makes its way towards the margin, and thence frequently beneath the membranes, until it makes its appearance externally. These are the cases which, although by no means so treacherous or so dangerous as the former, are generally described as accidental hemorrhage. In some of them, the general symptoms are as severe as those which accompany a case of placenta prævia, and in others are much more grave than the actual external flow would seem to account for. Sickness, pallor, dimness of vision, and fatal prostration may thus rapidly supervene in a case of this nature before even the symptom of flooding has attracted any particular attention.

Accidental hemorrhage may occur either before or during labor. The great diagnostic feature which, according to all authorities, from Rigby downwards, enables us to distinguish, during labor, between this form and unavoidable hemorrhage, is that, in the latter the effect of a pain is to increase the flooding, by still further separating the placenta; in the accidental form of hemorrhage, the presenting part descends during a pain, and thus, by plugging the cervix, stops the external hemorrhage.

Many writers seem to pass over these cases, as if they were of little

CHAPTER XXIV.

HEMORRHAGE AFTER DELIVERY.

HEMORRHAGE IN THE THIRD STAGE OF LABOR—ABNORMAL AND RETAINED PLACENTA, AND IRREGULAR UTERINE CONTRACTION, AS CAUSES OF FLOODING—POST-PARTUM HEMORRHAGE—CAUSES; GENERAL AND LOCAL—SYMPTOMS; OF EXTERNAL AND INTERNAL HEMORRHAGE: EXAMINATION OF THE ABDOMINAL WALLS: EXAMINATION BY THE VAGINA: GENERAL SYMPTOMS: SYMPTOMS WHICH INDICATE THE APPROACH OF DEATH—TREATMENT; PREVENTION: TREATMENT DURING THE HEMORRHAGE; PRESSURE AND FRICTION OVER THE UTERINE REGION—EFFECTS OF BANDAGING—EFFECT OF PASSING THE HAND INTO THE UTERINE CAVITY—APPLICATION OF COLD, SHOULD NOT BE CONTINUOUS—ASTRINGENTS TO INTERNAL SURFACE—GALVANISM—ERGOT—TREATMENT BY PLUGGING ABANDONED—VIEWS IN REGARD TO COMPRESSION OF THE ABDOMINAL AORTA—APPLICATION OF THE PERCHLORIDE OF IRON AND OTHER STYPTICS: OBJECTIONS TO, AND ARGUMENTS IN FAVOR OF THIS PROCEDURE—DR. BARNES'S PROCESS—TREATMENT DIRECTED TO THE GENERAL CONDITION OF THE PATIENT—EFFECTS OF REST AND POSITION—REACTION TO BE AVOIDED AFTER SEVERE FLOODING—TRANSFUSION: THE "MEDIATE" AND "IMMEDIATE" PROCESSES: DR. AVELING'S APPARATUS: INJECTION OF DEFIBRINATED BLOOD, AND OF SALINE SOLUTIONS.

ALTHOUGH hemorrhages which precede the expulsion of the placenta, are not, properly speaking, *post-partum*, we shall, for convenience' sake, consider them here. The proper management of the placenta, with the object mainly of preventing hemorrhage, has already been explained in the chapter on the Management of Labor; but there are some other important matters which are still left for consideration, and as some of these have strong analogies with true post-partum hemorrhage, it has been thought better to include them in this section of our subject. Retention of the placenta, and consequent hemorrhage, may be the result of mismanagement; but, independently of this, there are other causes, over which we have little or no control. If the circumstances attending the labor are in all respects normal, the placenta is probably separated entirely, either during the birth of the child, or in the course of the *dolores cruenti* which follow it. In a certain number of instances, however, the placenta is not separated in this manner; owing, in one class of cases, to some anatomical peculiarity in the form of the placenta, in a second to atony, in a third to irregular contraction of the organ, and in a fourth to what has been described as morbid adhesion.

Cases of abnormal placenta, in which the organ is divided, or has detached cotyledons, are of such rare occurrence that no practical importance can be supposed to attach to them. A full account of these given, with beautiful illustrations, in a recent work by Hyrtl.¹

¹ Die Blutgefäße der menschlichen Nachgeburt. Wien. 1870.

ing the uterine walls, which are no longer, in their structure, such as to admit of even ordinary force. Do what we may, portions of placenta are sometimes left behind, which may require to be removed as the causes of subsequent hemorrhage, or which may afterwards be spontaneously discharged,—a result which may, although very unjustly, be set down to the discredit of the accoucheur. Such retained masses have been removed, when unusually adherent, by the wire-rope *écraseur*.

In so far as the ordinary and normal condition of the placenta is concerned, the best safeguard against the hemorrhage in question is the proper management of the placenta during, and subsequent to, the birth of the child. This has already been described in another section of this work.

True *Post-partum* hemorrhage is an alarming and sometimes, in its effects, an appalling occurrence. When, in the course of labor, everything has passed as favorably as could be desired, the child is born alive, and the mother is apparently well, we naturally anticipate, as experience has taught us, a happy issue to the case. But the termination of labor, the real hour of trial to the mother, may be the beginning for her of a new and unforeseen peril. One of the essential physiological phenomena of labor is, as has been shown, the efficient contraction of the uterus during and after the birth of the child. This is nature's all but invariable safeguard. At times, unhappily, the uterine fibres which close the bloodvessels are relaxed, and blood pours forth with an impetuosity proportionate to the calibre and relaxation of the vessels, deluging the woman with blood, and reducing her in extreme cases to a condition of collapse which may be the immediate forerunner of death. So fearful is the torrent, in the worst cases, that, before we even have time to arrange our plan of treatment, our patient lies dead before us. The more experience one has of the practice of midwifery, the more do we dread the occurrence of this form of hemorrhage, which we can seldom foresee, and which is therefore all the more appalling, since we have seen no occasion to nerve ourselves and to prepare for an approaching emergency.

Causes.—A certain number of cases are, no doubt, due to slovenly practice, a neglect of those details which should be matter of routine in every case. But while such causes may generally be avoided by ordinary skill and attention, there are other instances where the causes upon which the flooding depends are comparatively little, and sometimes not at all, within our control. One of the most important and, at the same time, most common causes of post-partum hemorrhage is uterine inertia. It may be that in these cases the uterine effort is simply exhausted, and complete atony is the immediate sequel of labor. Anything which may have tended to reduce the vital powers may lead to this. In women who have long suffered from wasting diseases, whose constitution may have been exhausted by many rapidly succeeding pregnancies, or in whom the vital energies have been in a measure sapped by a long-continued or complicated labor, we see illustrations of those conditions, which are predisposing causes of hemorrhage after labor. No small proportion of the fatal cases seem to have occurred in women who were the subjects of the more advanced stage of Bright's

In a case which, many years ago, came under our notice, there was a rounded tumor narrowing towards its upper part and tightly embraced by the os, and it was this condition which led to an erroneous diagnosis. In a precisely similar case, one of the best known and most distinguished accoucheurs in Britain made a similar error, but fortunately discovered his mistake, just as he was about to remove the tumor by the *écraseur*, by the pain which the patient complained of, and which he knew by experience was a most unusual symptom in manipulating polypi. Let us beware, therefore, of mistaking a partially inverted uterus for a polypus which is protruding from the uterine cavity.

The *Symptoms* of post-partum hemorrhage are flooding, or the general symptoms to which it gives rise, or both of these combined. In by far the greater number of instances, the external discharge is at first, and throughout the whole course of the case, the most alarming, as it is the most palpable sign. It may immediately succeed the birth of the child, or may precede or follow the expulsion of the placenta. The quantity of the discharge is very variable, and upon this will depend, in a great measure, the opinion which we may form as to the gravity of the case. Generally, symptoms, more or less distinct, of uterine inertia will be manifested. The firm tumor which we are accustomed to feel behind the pubis loses its distinct outline, and becomes less perceptible to the touch; or may disappear altogether, so that we can perceive nothing but softness and flaccidity. We may then feel parts, such as the projection of the last lumbar vertebra and the promontory of the sacrum, which we know to be separated from the fingers by the tissues of the womb. If the inertia or atony of the uterus is complete, this condition is persistent, and on introducing the hand into the cavity, which may generally be effected with ease, we find that the uterine walls are soft throughout, and, as Cazeaux graphically describes it, "folded together like a piece of old linen." Such a condition, should it precede the separation of the placenta, may exist without hemorrhage; but, if the third stage of labor has been completed, flooding is inevitable. In many of these cases, however, it will be to the observer a matter of wonder that the hemorrhage should not be more profuse. Sometimes there are efforts on the part of nature to effect uterine contraction, when the hand, in the hypogastric region, may detect alternate relaxation and contraction of the organ, the latter periods being accompanied with the expulsion of such blood as may have accumulated within the cavity during the former. This disposition to rhythmical action on the part of the uterus is not to be looked upon with unnecessary apprehension, unless the actual flow of blood, or the general symptoms, are grave. Indeed, we are inclined to believe that it is so far a favorable symptom.

The absence of alarming external hemorrhage is a negative symptom, which may divert the attention of the inexperienced from the true nature of the case. In some of these cases, bleeding may be going on internally to an extent which may rapidly place the woman in a position of extreme peril. The continuous absence of the uterine tumor, and the formation, subsequently, of an extensive and soft abdominal swelling, progressively increasing in size, will, along with the general

often the precursors of death, which may be preceded by dilatation of the pupil, hysterical paroxysms, or even by convulsions. It has frequently been observed that the amount of blood lost is not a safe criterion of the danger; for, not only are we apt to be deceived in regard to the amount of internal hemorrhage, but there is the greatest possible variety in the symptoms which, in different women, attend a loss of a precisely similar amount; and it may be added that it is not invariably the strong and robust who bear hemorrhage best or recover most rapidly from its effects. In those cases in which hemorrhage after labor is due to a laceration more or less extensive of the os, or of any other portion of the parturient canal, the symptoms are rarely such as to excite alarm. The dangers to which such occurrences give rise are of a different nature, and do not manifest themselves till a later stage.

Treatment.—There are, perhaps, few practical questions involving more anxious consideration than this. The young practitioner may have, in the first case of midwifery which he is summoned to attend, an illustration of this accident. He has no time for reference to books, no moment even during which he may appeal to his memory for facts which have escaped it; and he must, therefore, be fully prepared by a thorough acquaintance with the subject, or he is unable to cope with so great an emergency. The principles on which all treatment depends, demand, then, his careful attention.

It is perhaps scarcely possible to attach too great importance to the prevention of post-partum hemorrhage. Much will depend upon a proper management of the various stages of labor, retarding the action when this has a tendency to be precipitate, promoting it when the pains are feeble, and acting otherwise as has been recommended in the chapter on the management of labor. The importance of never leaving a woman until you are satisfied with the uterine contraction after delivery will, in view of the circumstances above stated, now become more manifest. We can never be sure of the case unless we are satisfied on this point. There are certain points here, however, which if not understood, might result in the *nimia diligentia* of the tyro. First, it must ever be borne in mind that each case of labor is accompanied in its last stage with a certain amount of hemorrhage, and this is not unfrequently considerable, without being accompanied, either then or subsequently, with any other symptoms which should excite alarm. A second circumstance which may cause needless alarm is the gush of liquor amnii, mixed or colored with blood, which immediately follows the birth; and a third consists in what we very frequently observe, a certain amount of alternate contraction and relaxation which may seem to resemble, in some degree, the conditions above described. An erroneous inference, drawn from these observations, we have known to lead to treatment which was energetic enough certainly, but which was quite unnecessary, and, moreover, not unattended with risk. Caution must, therefore, be exercised, lest, by giving undue prominence to one symptom without reference to the others, needless panic and improper interference is the result.

There are cases in which the history of previous labors, no less than

water, or the application to the inner uterine surface of a piece of solid ice is, under circumstances of emergency, quite justifiable, and has often proved efficacious. The alternated action of heat and cold has been found more useful than sustained cold, the latter agent acting in two ways as an astringent and an excitor of uterine action. M. Evrat recommended the use of a peeled lemon, which he introduced into the cavity of the uterus and then squeezed, so as to project the acid juice upon the bleeding surface. A sponge wrung out of vinegar, and other astringents have, in the same way and for the same purpose, been introduced, and the effect of such applications has not unfrequently been to rouse the uterus from its dormant condition. Galvanism has also been employed with good effect, and may always, if immediately available, be tried. In all cases in which the cavity of the womb is occupied with clots, these should be removed, as they often seem, by presenting a mechanical impediment to feeble contraction, to encourage a continuance of the flooding. As in the case of artificial extraction of the placenta, it is well to allow the hand and the clots to be simultaneously expelled by uterine action, should it be possible to arouse the organ to such an effort.

In the worst cases, little dependence can be placed in the use of ergot, for before sufficient time may have elapsed to admit of the physiological action of the drug, the patient may be dead. It may often, however, be tried, and if so, is to be given in full doses, and at as short intervals as is possible. The stomach will, however, often reject it, as indeed, when the patient is in a state of extreme collapse, it will reject anything solid or fluid which may be swallowed. This is not at any time to be looked upon as in itself an altogether unfavorable occurrence, as it has often been observed that violent retching has been attended with uterine action, so much so indeed that some practitioners have actually prescribed ipecacuanha with the view of obtaining its emetic effect. Plugging as a method of treatment in these cases is of ancient origin, and has been advocated in modern times by Leroux and others who adopted his opinions. This method of treatment has, however, proved inefficacious, and has been abandoned. The mode of action must obviously have been, whether the plug was applied in the vagina or within the womb, to convert external into internal hemorrhage, and in no sense, therefore, to benefit the patient. The last attempts of this nature which have been made would seem to have consisted in the introduction within the uterus of Gariel's air pessary, which was then distended in the hope of compressing the bleeding vessels, an effect which a more correct knowledge of the condition of the uterus will not permit us to count upon.

The flaccid condition of the abdominal walls which immediately succeeds delivery, enables us, without any difficulty, to press upon, and more or less effectually arrest the flow of blood through the aorta. In desperate cases, therefore, the compression of this great vessel has been practiced, in order to arrest the torrent which continues to pour from the uterine vessels; but the practice has by some been violently opposed on theoretical grounds. Baudelocque maintained continuous pressure upon the aorta for several hours at a time, and imagined that in this

The perchloride produces immediate coagulation of any blood with which it may be brought in contact, but the danger to be dreaded is, that such coagulation might extend further, and should coagula be carried to the centre of circulation, death would be the probable, if not the inevitable, result. Immediate death has followed the injection of even a few minims into a nævus, and in one such case which is quoted by Dr. Barnes, "examination showed that the point of the syringe had penetrated the transverse facial vein, and that the blood in the right cavity of the heart had been immediately coagulated." Several cases have occurred on the Continent, and at least one in England, in which an injection of the perchloride has resulted in death by peritonitis, caused by the passage of a portion of the injection through the Fallopian tube. It is not to be forgotten that a similar result has followed the injection of fluids which are comparatively innocuous, but the possibility of such a result must, under no circumstances, be lost sight of. Forcible injection of the uterine cavity should never be attempted. Were it possible thoroughly to sponge the inner surface of the uterus in an efficient manner, this, no doubt would be preferable; but, as it would be all but impossible thus to bring the styptic solution into actual contact with the bleeding surface, some other means must be adopted. We are ignorant, it must be remembered, of the extent, or even the exact site of the surface from which the blood flows; and, moreover, the cavity is so occupied with fluid and clotted blood, that we could not hope, by any mere process of sponging the actual surface of the mucous membrane, effectually to reach it. It would be necessary therefore, as a preliminary measure, to wash out the uterus. Dr. Barnes says, however, that the conditions inseparable from a recent delivery, are a relaxed and patent condition of the os, which would readily admit of an escape into the vagina of any fluid injected in excess, so that the conditions are, in all respects, different from what has obtained in most of the fatal instances recorded, where injection has been practiced in an unimpregnated, and sometimes in a displaced, uterus.

The following is the course recommended by Dr. Barnes: "You have the Higginson's Syringe adapted with a uterine tube eight or nine inches long. Into a deep basin or shallow jug, pour a mixture of four ounces of the *Liquor Ferri Perchloridi Fortior* of the British Pharmacopœia, and twelve ounces of water. The suction-tube of the syringe should reach to the bottom of the vessel. Pump through the delivery-tube two or three times to expel air, and insure the filling of the apparatus with the fluid before passing the uterine tube into the uterus. This, guided by the fingers of the left hand in the os uteri, should be passed quite up to the fundus. Then inject slowly and steadily. You will find the fluid come back into the vagina mixed with coagula, caused by the styptic action of the fluid. The hæmodynamic effect of the iron is produced in three ways: first, there is its direct action in coagulating the blood in the mouths of the vessels; secondly, it acts as a powerful astringent on the inner membrane of the uterus, strongly corrugating the surface, and thus constricting the mouths of the vessels; thirdly, it often provokes some amount of contractile action of the muscular wall." All facts hitherto recorded seem to show that

with caution; and although the tolerance of stimulants is, during the hemorrhage and in presence of the symptoms of collapse, sometimes truly marvellous, when brandy seems to produce no more effect on the brain than as much pure water, it is quite otherwise when the immediate danger has passed and the patient begins to rally. When the symptoms which indicate reaction subside, it may be necessary to persevere, by means of generous diet, old wine, and tonics, for many weeks, or even months, before the system recovers from the fearful state of depression into which it has been thrown.

There are cases in which the arrest of hemorrhage, although complete, seems to have come too late, the recuperative forces of nature having been too seriously compromised. There remains in these cases a state of utter prostration in which there seems to be no tendency to rally, an irritable stomach, a continued tendency to syncope, and an apparent arrestment even of the function of assimilation. Such a state of matters can only terminate in one way, unless we can induce a rally, and the feeble hold which the patient has on life is gradually, but too surely relaxed. These are the cases in which, however desperate the circumstances, the operation of transfusion has succeeded, and may again, as we hope, succeed in rescuing the woman from the very jaws of death. This operation may be performed in various ways. The simplest process is that of *immediate* transfusion by some such simple apparatus as has been recommended by Dr. Aveling.¹ This is described as consisting "of two small silver tubes to enter the vessels, and of an india-rubber tube by which they are united, and which has in its centre

FIG. 130.

Dr. Aveling's apparatus for transfusion.

an elastic receptacle, holding about two drachms. It is without valves, and is simply a continuous pipe with an expanded portion in the middle. By its means, the vessels are, as it were, extended from one to the other, and a supplementary heart is added to regulate the circulation." Air is got rid of by first pumping water or a saline solution through it,

¹ Obstetrical Transactions, vol. vi, p. 133. 1865.

CHAPTER XXV.

INVERSION OF THE UTERUS.

VARIETIES OF INVERSION: THREE STAGES OF THE ORDINARY VARIETY—INVERSION USUALLY OCCURS DURING THE THIRD STAGE OF LABOR—INVERSION OF THE UNIMPREGNATED UTERUS—CAUSES: DRAGGING UPON THE CORD: SHORTNESS OF THE CORD: IRREGULAR CONTRACTION OF THE UTERUS—CONNECTION OF THIS ACCIDENT WITH HOUR-GLASS CONTRACTION—EFFECTS OF PARALYSIS OF THE FUNDUS—MECHANISM OF THE DISPLACEMENT—SYMPTOMS: PECULIAR VIOLENCE OF THE SHOCK: HEMORRHAGE: ABSENCE OF TUMOR IN HYPOGASTRIUM—TO BE DISTINGUISHED FROM A FIBROUS POLYPUS—SENSIBILITY AND OCCASIONAL CONTRACTILITY OF THE TUMOR—MODES OF PROVING THE ABSENCE OF THE UTERUS FROM ITS NORMAL SITUATION—RECURRENCE OF HEMORRHAGE IN CHRONIC INVERSION—TREATMENT: ORDINARY METHOD OF REPLACEMENT: MANAGEMENT OF THE PLACENTA IF STILL ADHERENT: MANAGEMENT OF MORE DIFFICULT CASES: COMPRESSION OF TUMOR: DEPAUL'S INSTRUMENT—CHRONIC INVERSION: MONTGOMERY'S METHOD OF REPOSITION: CONSTRICTION OF THE OS MUST BE OVERCOME: EFFECTS OF SUSTAINED ELASTIC PRESSURE—DIVISION OF THE STRICTURE: REMOVAL BY THE ECRASEUR.

INVERSION of the Womb has already been referred to in the preceding chapter as one of the causes of hemorrhage after delivery. There are, in addition to this, other circumstances, of no less importance, which render the subject one demanding, at our hands, special and careful consideration. Although the accident is by no means of frequent occurrence, it is not to be supposed that, on that account, it is necessarily to be treated as one of minor consequence. On the contrary, it involves so many practical questions, and is, moreover, a subject in regard to which so much misapprehension has existed, and still exists, that it is necessary to devote somewhat more of space to its consideration than its importance might, in the first instance, seem to warrant.

The idea essentially involved in the term "Inversion of the Womb" is an abnormal condition of that organ, in which, in extreme cases, the whole organ is turned inside out. As has already been remarked, such a displacement must, in becoming complete, pass through a variety of stages; and as, at any one of these stages, the inversion may be arrested, it is possible to imagine an almost infinite number of varieties of inversion. We shall, however, only mention four. Of these, the first is not generally described, but is said by Dr. Matthews Duncan to be "not rarely observed after delivery." The condition of the parts is, as shown in

FIG. 131.

Partial inversion. (After
Matthews Duncan.)

more or less strong. At the same time, we must confess that we incline to Tyler Smith's conclusion. It is certainly true, as he says, "that the unimpregnated and virgin uterus, particularly under irritation, possesses more motor power than is generally attributed to it;" and we can see no physiological reason which can warrant us in assuming such an inversion to be impossible. Many years ago, we had occasion to assist at the post-mortem examination of a young woman who had died of fever, and who had suffered previously to her death from severe flooding. The uterus was found completely inverted, and of very little, if any, greater size than the normal unimpregnated standard. There was neither polypus nor fibroid growth. This case corroborates strongly the assertion of Tyler Smith, and, at least, proves that previous enlargement of the organ, and a yielding condition of its walls, are not, as West supposed, essential. There cannot be the slightest doubt that the presence of a polypus, or of anything else, within the cavity of the uterus must so far encourage inversion, both mechanically and physiologically. In the above case, there may have been a clot: but whether or no, it, and other cases of an allied nature, seem to show that inversion of the unimpregnated uterus, independent of polypus, or any other similar condition, may occur.

Causes.—The occurrence of uterine inversion, coincident, as is to be feared, very frequently, with the practice of dragging upon the cord after the termination of the second stage of labor, has led not unnaturally to a prevalent belief that this was the usual cause of the accident in question; and it has also been supposed to be due, in some instances, to spontaneous dragging by a funis which is either too short, or has been rendered so by twisting round some part of the child. According to these ideas, the uterus must be looked upon as a passive agent, the fundus or site of placental attachment being mechanically displaced in a direction downwards, and ultimately through the os and into the vagina. That a certain number of cases are thus produced, most observers will probably admit; but the conclusion arrived at by all who have paid, in recent times, most attention to the subject, is, that the importance of this, as a cause, has been in every way exaggerated. A strong pull at the cord, while the uterus is in a state of flaccidity or complete atony, may doubtless—and especially if the placenta be morbidly attached—at once turn the organ inside out. Indeed, if such flaccidity were the normal condition of this stage, it would be a matter of wonder that the accident should not invariably accompany every effort in this direction, did we not observe that nature here interposes her authority, and effectually guards the woman, as we shall see, from the effects of operative mismanagement. Nothing, as a moment's reflection will show, is so certain, so effectual a safeguard against inversion, as regular and symmetrical contraction of the whole uterus. It is fortunate, therefore, that a very usual effect produced by pulling upon the cord is a contractile action of this nature, by which, for the time being, depression or introcession of any part of its walls is rendered impossible. Be it observed, however, that this observation applies to *regular* contraction only.

The uterus does not, in every instance, follow the method of regular

the effective form of what is familiarly known as "bearing-down" effort.

Whatever may be the view entertained as to the initiatory process by which spontaneous uterine inversion is effected, numerous authentic facts attest that such an occurrence takes place by the operation of causes which may be at once abnormal and spontaneous. So soon as the stage of depression has been established, as represented in Fig. 132, the further progress of the case admits of easy explanation. The analogy which at this stage exists between inversion and an ordinary case of "hour-glass" contraction has not failed to attract the attention of many of the more eminent writers on this subject. In both, we find the region of the fundus in an abnormal condition of atony, but the parts below are in a state of more or less efficient contraction. A stimulus to sustained and active contraction is afforded by the presence within the cavity of a tumor. "The annular contraction of the body of the uterus grasps," says Tyler Smith, "the introcedent fundus as it would a foreign body, and carries it downwards for expulsion through the os uteri, the os itself being at this time either in a state of inertia, or actively dilated, just as at the end of the second stage of labor. After the inverted uterus has passed through the dilated os uteri, this part of the organ becomes contracted, preventing reinversion from taking place. Thus there is, first, the depression of the fundus uteri, with annular or hour-glass contraction of the body of the uterus, and dilatation of the os uteri. Next, there is intussusception of the fundus by the body of the uterus. Lastly, complete inversion occurs, with contraction of the os uteri upon the inverted organ. If we wished to describe this action in three words, they would be—introcession—intussusception—inversion" (see Figs. 133–134).

It must not be supposed that, by thus supporting the doctrine of spontaneous inversion, the production of the accident by artificial or violent causes is ignored; still less, that any support is given by implication to the improper practice of pulling upon the cord with the view of effecting separation of the placenta. It will be inferred from what has already been said, that there are two classes of cases, in one of which the uterus is completely and in the other partially paralyzed. Inertia, therefore, in some form or another, is an essential concomitant of all cases of inversion. In complete atony of the organ, uterine activity can take no part in the displacement, although bearing-down or abdominal effort may; but in the other variety, where, as has been shown, local paralysis has its usual seat about the fundus, uterine effort is the efficient cause in all cases of spontaneous inversion, and in those in which the displacement is artificially produced, there is every reason to believe that there must be, so to speak, a consenting action on the part of the uterus, which then acts in unison with the force which is applied. If any further evidence were held to be necessary to establish the fact of such an occurrence, it is to be found in the instances which have been put on record of post-mortem inversion, which can only thus be satisfactorily explained.

Symptoms.—Inversion generally takes place after the birth of the child, and before the placenta has been expelled. The patient being

the intussuscepted fundus is tightly grasped by the os and its diameter at this point thereby reduced, the resemblance to a fibroid polypus is greatest, and it is here that the tests of immobility and sensibility may be most usefully applied. The nature of the case may be still more conclusively demonstrated by such modes of examination as may prove the absence of the uterus from its normal situation. On this point Barnes recommends that we should pass one or two fingers into the vagina to the root of the tumor, and then press down the fingers of the other hand behind the symphysis. If in doing this we can make the fingers meet, and feel from the outside the funnel of the inverted uterus, our diagnosis will be confirmed. Or again, we may pass a finger into the rectum so as to get its point above the root of the tumor, and then pass a sound into the bladder, with its point turned backwards, so as to meet the finger in the rectum, which, if it can be effected, will equally show that the uterus is absent from its usual situation, and consequently, by inference, that the tumor in the vagina is the uterus.

Simple prolapsus or procidentia, when occurring immediately after labor, may also be mistaken on a careless or cursory examination for inversion, but more careful observation will at once in such cases disclose the real nature of the case, so soon as the depression corresponding to the os and the orifice itself is recognized in the centre of the projecting tumor.

The symptoms above enumerated are those of an ordinary case of uterine inversion occurring in the course of labor, and do not, of course, apply in all respects to the other and rarer varieties. Assuming it for the moment as proved, that inversion of the unimpregnated organ is a possible occurrence, it is undoubtedly so rare that little or nothing can be said as to its symptoms; but we may assume that hemorrhage, pain, and nervous shock will be among these, and that the diagnosis may be unusually difficult. There may be cases, again, in which the presence of a polypus is established, and yet inversion may occur, the two conditions thus coexisting, although the former has in all probability been the direct cause of the latter. There are yet other instances in which inversion may succeed delivery, and yet not follow so closely upon it as under ordinary circumstances it does. Possibly in such the initiatory stage of depression has alone been produced during labor, and this again has been transformed into one or other of the more advanced stages by irregular contraction or modifications of what are known as after-pains. It would appear as if occasionally the symptoms, at the time of the inversion, were not so marked as usual; for there can be no doubt that the accident has sometimes been altogether overlooked at the time of labor, and only discovered long after. When the woman recovers from the immediate effects of inversion, she may regain her health and strength as if nothing ailed her, and be able to follow her ordinary avocations. But, in such cases, the original symptom of hemorrhage will, sooner or later, return, and, by its periodic recurrence—corresponding often, as might be anticipated, to catamenial periods—saps the strength and undermines the health of the patient. These constitute cases of Chronic Inversion.

of the neck of the tumor is to cause general tumefaction of the parts beneath, so that it will often be necessary to compress the organ from side to side, in order to curtail its dimensions in that direction before attempting actual reduction. By this manœuvre a difficulty, which may at first seem insuperable, will sometimes be overcome. By the ordinary procedure, by means of the fingers, the reposition of the uterus has been found by some operators to be so difficult that instruments have been used, which, being of less bulk, offer certain mechanical advantages. Of such a nature is the *bâton repoussoir* of Depaul; but to this it may fairly be objected that the gain is probably more than counterbalanced by increased risk; and it must be confessed, in this as in many other operations in midwifery, that the more experienced and skilful the accoucheur, the more does he prefer his fingers to mechanical aids, however ingenious.

When the fundus has passed to a certain distance within the os, it has very frequently been observed that the same muscular action of the uterus which originally contributed to the dislocation of the organ now comes into play as an auxiliary to reposition, and it is very frequently observed that the ultimate complete restitution of the fundus is effected by a sudden jerk or snap, which is often quite audible to the bystanders. In those instances, however, in which the inertia of the organ is persistent, it will be necessary to pass the hand quite within the cavity, until we are convinced that its anatomical relations are completely re-established. Nor is it proper at this moment, and at once, to withdraw the hand. We should rather act here as we would do in a case of encysted placenta, or of post-partum hemorrhage, in which the hand is introduced for the removal of the uterine contents; and it is, therefore, advisable to allow it to remain in contact with the uterine walls, and to act with the other hand, in concert with it, through the abdominal walls, so as to excite the organ to efficient and symmetrical contraction, which is a safeguard both against hemorrhage and reinversion.

There is another class of cases in which the difficulties are still more formidable than any which have hitherto been described. It may be assumed that the longer the standing of the case the more serious will be the obstacles to reduction, until it reaches the condition to which the name Chronic Inversion has been given. Where, it may be asked, may we assume acute inversion to end, and chronic inversion to begin? The only rational reply to this question with which we are acquainted is that which is given by Dr. Barnes in his recent work. "I would distinguish the cases in this way: Inversion is recent so long as the physiological process of involution of the uterine tissues is going on. When this process is complete, and the uterus has returned to its ordinary condition, the inversion is chronic." In all cases of unusual difficulty, whether recent or chronic, the process of taxis, recommended by Montgomery, McClintock, and other distinguished practitioners of the Irish School, may be attempted. The idea here is to regard the inversion as a hernia, and to replace that part first which comes down last. The neck of the tumor is to be firmly grasped, and pushed upwards, continuous pressure being thus maintained upon the contracted os. If the cervix can be insinuated within the lips of the os

which it would be impossible to describe here. The idea of section of the constriction must have often suggested itself; but Dr. Barnes was probably the first to carry a case to a successful termination by this operation.¹ The proceeding, as described by him, is as follows: "Draw down the uterine tumor by means of a loop of tape slung round the body, so as to put the neck of the tumor upon the stretch; then with a bistoury, make a longitudinal incision about half an inch long, and a quarter of an inch deep, on either side, into the constricting os; then reapply the elastic pressure. Next day, try the taxis, and reapply the elastic pressure if necessary. Elastic pressure alone, or aided by this operation, will, I am convinced, overcome every case of inversion, except when fixed by inflammatory adhesions."

Very rare cases have been met with in which menstruation has gone on regularly from the surface of an inverted uterus; and, indeed, observation of such cases has thrown some light upon the source of the menstrual discharge. In such cases, leucorrhœa, and the presence of a tumor within the vagina, may be the only symptoms, but the almost invariable rule is repeated flooding, and that to such an extent as to bring the patient into a condition of immediate danger. Failing all the means already detailed—in the practice of which it has been assumed that full advantage has been taken of chloroform, an invaluable agent in all cases of uterine spasm—is there any other method which we may adopt for the relief of a woman who may be dying before our eyes from the effects of this accident?

The only possible remedy in such a case is removal of the inverted uterus, as this alone can be expected effectually to check the hemorrhage. The objections to such a procedure are sufficiently manifest; for not only is the case one of mutilation, by which the woman is unsexed, but it is one the immediate risk of which is very great. Still, the operation has been repeatedly performed with success, and the woman has enjoyed perfect health for many years thereafter. In the only case which has come under our observation, the patient, who was operated upon about seven years ago, is still alive, and in perfect health; and it is worth remarking, in addition, that she has never menstruated since, but that the menstrual molimen is apparently relieved by periodical or vicarious leucorrhœa. If, therefore, the doom of a patient seems fixed, if we decline to interfere, we can have no hesitation in resorting to a measure so extreme as the removal of the organ: and, of course, at the present day, the operator would select the *écraseur* in preference to the older methods of ligature or excision. The best instrument for the purpose is the wire-rope *écraseur* of Braxton Hicks, which may be used either with fine wire twisted into a rope as recommended by the inventor, or with a single strong wire as is recommended by Barnes. The responsibility which attaches to an operation such as this cannot fail to weigh upon the operator; and he will, therefore, at once recognize the necessity, before finally committing himself to this course, of making himself sure on two points: first, as to the accuracy of his diagnosis; and, second, that the tumor is beyond all doubt irreducible.

¹ Medico-Chirurgical Transactions. 1869.

impossible, in many of these cases, to distinguish between this accident and the rupture of the sac of an extra-uterine pregnancy, as the symptoms are, in the two cases, almost identical. The very rarity of spontaneous rupture has not unfrequently given rise to suspicion of foul play in such cases, and the question has, therefore, a medico-legal significance, in reference chiefly to criminal abortion; but there will probably be little difficulty in recognizing a spontaneous rupture on post-mortem examination, as this is generally at the fundus, while criminal injuries are more frequently discovered in the region of the os and cervix. Besides, the nature of the injury is so different, that the appearance of a spontaneous rent and a violent laceration could scarcely be mistaken; and, moreover, there often is to be found, as the cause of these ruptures, a diseased condition of the structures of the womb. Ruptures during the course of pregnancy may occur as early as the third month, but are more frequent, the more advanced is the development of the foetus.

By far the greater number of cases occur during labor, and it is to these that attention must be more particularly directed. The laceration in these cases generally involves the entire thickness of the uterine walls, but there are exceptions to this rule. In some, the rent has been found to have extended through the mucous membrane and proper tissue of the uterus, and to have been arrested by the peritoneum, which had remained intact. The mobility and distensibility of the peritoneum upon the subjacent uterine tissue in some measure encourages this; and it is, therefore, at the lower portion, where the connection of the peritoneum is looser, that this has been more frequently observed. The result of such cases, although often fatal, is not so much to be despaired of as when the laceration is complete; but a frequent result probably is the effusion of blood between the peritoneum and the tissues beneath, and the consequent formation of peri-uterine hæmatocele. In many of these instances, it is most likely that the fact of laceration is not recognized at all at the time of its occurrence. Another rare variety of rupture consists in numerous fissured lacerations of the external surface of the tissue proper of the uterus, immediately beneath the peritoneum, which may give rise, as in the other case, to subperitoneal hemorrhage; while, in other instances, the peritoneum itself is the only part which is lacerated, the uterine tissues escaping altogether.

Any part of the uterus may be the seat of laceration, while the rent in the tissues may take any direction, and, in extent, may be limited only by the size of the organ itself. It may thus be either longitudinal or transverse; and may, in the first case, correspond to the entire length of the uterus, and, in the latter, the laceration may extend completely around the uterus, thus dividing it into two. Both of these are extreme cases: the rent is generally much more limited in extent. Considerably more than a half of all the ruptures at the full time occur in the region of the cervix, generally at that part which marks the junction between the uterus and the vagina. Next in point of frequency comes the body; and last of all, the fundus, which is, as we have seen, the site preferred in early pregnancy. One of the most remarkable monographs on this subject is one which was published, in 1848, in the *American Journal of Medical Science*, by Dr. James D. Trask,

and is based on an analysis of over four hundred cases. The following represents the proportion of cases in the various situations named, as deduced from his statistics :

Ruptures of the Cervix,	.	.	.	.	.	55 per cent.
" " Body,	.	.	.	.	.	36 "
" " Fundus,	.	.	.	.	.	9 "

The reason of the comparative frequency of rupture at the cervix is afforded by a moment's consideration of the mechanism of the dilatation of the os, which has been fully detailed in reference to the progress of the first stage of labor. The os, as was explained, is dilated by the combined action of the longitudinal fibres of the uterus and the bag of waters, or, in the absence of the latter, by the presenting part of the child ; so that we cannot wonder that the usual seat of rupture is where the greatest amount of force is brought to bear. Trifling ruptures of the vaginal portion of the cervix are among the most common of the minor accidents of midwifery. But, even when lacerations of this part are much more extensive, the rent does not necessarily involve the peritoneum, so that the gravity of the case will depend chiefly upon whether or not that membrane is injured. In some rare instances, the laceration has extended into the bladder, and in others, rarer still, the whole vaginal portion of the cervix has been separated, in the form of a ring, which has been born with the child. Lacerations of the cervix alone are very common, and generally take a vertical direction. They are said to occur more frequently on the left than on the right side.

It was at one time generally supposed, and it is even now stated by many writers, that there is less liability to rupture in first than in subsequent pregnancies. A more correct observation of such statistics as bear on that subject,—among which those of Churchill and Trask are best known,—shows that this is not the case, but that there is, if anything, a preponderance of primiparous cases. The error has arisen from comparing first with all other labors ; but, if we compare first with second, third, fourth, and so on, individually, but not collectively, the result will be found to be as we have said. Another view, all but universally held, was that the accident was a common result of protracted labor ; and it is, indeed, not unnatural to suppose that this should be the case ; but there is, perhaps no one point which is brought out more strikingly in Dr. Trask's cases than that the actual duration of labor has little or nothing to do with it. In 104 out of 147 cases, rupture occurred within twenty-four hours of the commencement of labor. It must, however, be remembered that the usual course of a protracted case is failure of the pains ; so that, although we may fairly assume that long-continued effort would endanger tissues weakened by exhaustion, nature here arrests the pains, and thus interposes for the protection of the parts, vigorous action being only restored when she has had time to recruit her exhausted powers.

Causes.—Whatever views may be entertained in regard to the two conditions above alluded to, there can be no doubt that anything which mechanically impedes the course of labor is an undoubted cause of rupture of the uterus. The sex of the child thus plays, as might be ex-

pected, an important part, as is shown from the statistics of the Dublin Lying-in Hospital, extending over a long period, from which it would appear, that in nearly 70 per cent. of all the cases of rupture the sex was male. Trask's cases show, no less clearly, that pelvic deformity, or disproportion, is another important cause, which had been proved to exist in 74.74 per cent. of his cases. For the same reason, faulty presentations, which are an impediment to labor, may be the direct cause of uterine rupture; thus, in 303 cases given by Trask, of all presentations, 16 were presentations of the shoulder. Forceful compression of the neck of the womb between the head of the child and the pelvic walls is supposed by Dr. Murphy to play an important part in inducing rupture of the womb, so that if it is pinched anteriorly against the iliopectineal line, or posteriorly upon the promontory of the sacrum, anterior or posterior lacerations of the cervix are to be explained by the mechanical action of the fundus and the longitudinal fibres.

Although we have every reason to believe that the more accurate knowledge of modern times has had a marked effect upon the results of modern practice, it must still be admitted that operative violence cannot be overlooked as a cause of rupture of the uterus. We do not here refer to such cases as occur in consequence of causes of a pathological nature, to which we shall again advert, where the accoucheur is often unjustly blamed; but to those in which errors of judgment, or rashness in operative procedure, lead to this disastrous result. The most common of all midwifery operations, for example, may, in any case, be attended with extensive laceration; for, if we apply the forceps without due consideration, and careful observation of the state of the os, we may readily rend those tissues and destroy our patient. In the same way, clumsy manipulation in turning may, at any stage of that operation, in a moment plunge a satisfactory case into the category of hopelessness; and so, in a hundred different ways, operative incompetency may, in the attempt to shield the woman from danger, only precipitate her doom. The improper administration of ergot has, there is only too good reason to believe, been attended with a similar result in no insignificant number of cases, where that powerful drug has been given in tedious cases, without any reference whatever to the amount of mechanical resistance which has to be overcome; and we rather think, that if the truth were known,—which, for obvious reasons, is often withheld,—this, as a cause of uterine rupture, would stand prominently forward. Professor Bedford of New York has in his museum four wombs ruptured by the improper use of ergot. A preternatural violence in the uterine contractions, even when associated with no marked resistance beyond what is perfectly normal, may also induce rupture by the actual impetuosity of the propulsive effort; but such cases, in the absence of morbid excitement of some kind, are probably very rare. When such morbid excitability does exist, it is astonishing, however, by what trifling causes violent action may be set up. It is by no means rare, that the slight irritation of the cervix which occurs in the course of an ordinary vaginal examination, arouses, by a reflex act, an amount of expulsive effort which may thus lead to rupture from a cause apparently so simple. Examples of this kind have been from time to time recorded, but cases which are centric in

Recent observations tend to show that that process of fatty degeneration which, as we have shown, is so essential a phenomenon of the normal process of involution (see Fig. 128, p. 361), sometimes takes place prematurely; and, if so, it can be readily understood how such an occurrence—under the circumstances, of course, a pathological one—must essentially contribute to the risk of rupture. And there can be little doubt, as Tyler Smith observes, “that in cases where the uterus is feebly developed, or weakened by disease and exhausted action, the contractions of the abdominal muscles must contribute to the rupture of the organ, by urging the head or presenting part of the child through the os uteri.”

Symptoms.—The causes of rupture of the uterus being so various, it will excite no astonishment that the symptoms are far from being uniform. Very violent and tetanic uterine contraction, under circumstances which, for the time at least, render it impossible that labor can make much progress, will always excite our apprehension, and may seem to call for such means as we have at our command for moderating excessive action. But, the powers of nature are such that, even in the most unpromising circumstances, the dreaded result seldom ensues. The significance of the premonitory symptoms is, however, greatly increased if, along with contractions of this nature, the woman complains of pain of an unusual intensity; and, if the site of such pain should correspond to a point where it had been complained of before labor, our fears will be proportionally increased. We cannot, however, trust to premonitory symptoms. Indeed, in the great majority of cases, we have not even the benefit of such obscure signs as have been mentioned, and thus the climax of the case is attained while we are quite unprepared for a casualty so dreadful.

As a general rule, the symptoms which denote actual rupture of the uterus are well marked. At the height of a pain, a sudden and excruciating pang may occur. This is sometimes accompanied with a snap which may be audible to the patient and even to those about her. The pain suddenly ceases, and is almost instantly followed by alarming prostration and shock, which is modified, more or less, by the characteristic symptoms of hemorrhage. This may be altogether internal, or may be indicated by a gush of blood from the vagina, according to the portion of the uterus which has been the seat of the rupture. The countenance becomes pallid, with a fearful expression of alarm and anxiety; the face is bedewed with a clammy sweat, and the extremities and general surface become cold. The stomach ejects its contents, and at once throws off anything which may be swallowed; and it has sometimes been noticed, after protracted retching, that the matter vomited is of the color and appearance of coffee-grounds. The respiration becomes labored, and the pulse becomes rapid, feeble, irregular, and ultimately imperceptible. Simultaneously with these symptoms, the signs of the life of the fœtus disappear. In some cases, the occurrence of rupture is not marked either by acute pain or by the other symptoms above enumerated, and the dangerous condition of the patient may only become apparent after a considerable period has elapsed, it may be hours, or even days. These are, for the most part, cases in which the

cal effect of spontaneous inversion. Lacerations involving both vagina and uterus are not uncommon, and it is probably difficult in some of these instances to determine for certain in which of the two textures the rupture has had its origin ; but there can be no doubt that lacerations, either of the cervix uteri or of the upper part of the vagina, must, in consequence of their intimate anatomical relations, be very apt to extend from the one to the other. A considerable hemorrhage could scarcely fail in such cases to be a prominent symptom.

Treatment.—It is scarcely necessary to observe that, if there be any possible means whereby we may succeed in preventing this accident, such must necessarily be by far the most important part of the treatment. But, unfortunately, the cases in which prevention is possible are rare ; or, rather, the indications which demand preventive treatment are so obscure in their nature that it is difficult to tell, on the one hand, whether we are called upon to interfere, and on the other, whether, having interfered, the safety of the patient may fairly be attributed to our conduct in the case. The latter point is perhaps the most difficult of all. We recognize, let us suppose, a serious mechanical impediment to delivery, which coexists with violent and long-continued uterine effort, and which may seem to imperil the integrity of the uterine tissues. We operate, by the forceps, turning, or otherwise, and speedily relieve the patient ; but when are we entitled to say that such prompt and decisive action on our part has actually averted a great calamity ? We may, indeed, be perfectly certain that a well-considered and definite plan of treatment, in accordance with which operative assistance is afforded or withheld, will reduce rupture of the uterus to a minimum, as is well shown by the statistics of large lying-in hospitals, where this accident is one of those least frequently met with. It cannot, however, on the other hand, be doubtful that a needless dread of rupture, which inexperience is certain to exaggerate, leads in not a few instances to operative interference, which may be perfectly unnecessary, although the operator does not fail to congratulate himself on a fortunate issue, which he fancies to be due to his prescience and skill.

Apart from this, there are, however, certain conditions upon which an intelligent preventive treatment may be founded. The occurrence, for example, in the course of gestation, of acute pain, referable to some particular part of the uterus, has often been known to precede rupture in the part affected, which is believed in these instances to have been the seat of local or limited metritis. Should any suspicion, therefore, of this be entertained, it will be proper to adopt such means as may seem suitable with the view of subduing such morbid action as is assumed to exist. One, and by no means the least important, of the objects which the accoucheur has in view in inducing premature labor in cases in which there must be disproportion of parts at the full time, is to avert the danger of rupture which fruitless uterine effort might in any case produce. And he will, in like manner, feel himself impelled to prompt and energetic action, when the expulsive effort of the uterus is morbidly in excess. In some of these cases, the contractions attain a tetanic violence, which seems at every moment to imperil the integrity of the uterine tissues ; and, if the period should not have

will be found to have escaped through the gap in the uterine parietes into the abdominal cavity, and, if contraction has subsequently taken place to any considerable extent, the aperture may thus be so reduced that great difficulty will be encountered in any attempt to draw it down. Too much caution cannot here be observed with the view of avoiding further laceration and extension of the wound. Were we to attempt to force the hand through the opening in order to seize the placenta, this would almost certainly occur. It is better, therefore, to use the cord as an extractor, and to pull the placenta towards the opening and then cautiously through it, and in this way complete the delivery. A prolapse or hernia of a portion of the intestine through the wound is by no means an unfrequent complication of such cases, and it is a matter of doubt in many instances whether we should or should not attempt to replace the protruding intestine. In so far as the risk of strangulation is concerned, this is a matter of trifling importance, for the usual situation and direction of the rupture, and the relation which it bears to the uterine fibres, render it a very unlikely matter that strangulation should occur; and, apart from the chance of a recurrence of the prolapse, it may fairly be doubted whether the risk of displacing the clots and again disturbing the wound will not do more harm than good,—as recovery has taken place even when a considerable coil of intestine has passed through the wound and occupied the vagina.

In a very considerable proportion of cases of rupture of the uterus, it is impossible to deliver by the natural channel, on account either of pelvic deformity, contraction of the os, or escape of the child into the abdominal cavity. In the first case our course of procedure will depend upon the degree and extent of the deformity; and in the second, the rigidity may possibly be overcome by the use of chloroform, or even by incision of the tissues of the os, our object being, in every case in which the child remains in the uterine cavity, to deliver, if it be possible, *per vias naturales*. But in the third case, when the child has escaped from the uterus, and lies among the intestines in the abdominal cavity, our treatment must be essentially different. So hopeless were such cases at one time generally regarded, that some of the most eminent accoucheurs—Denman among others—recommended that we should not in any way interfere, but leave the case to nature, as it has happened that women, even under such desperate circumstances, have recovered, the child ultimately being discharged piecemeal by the ulcerative process, as in cases of extra-uterine pregnancy. In several cases in which rupture of the uterus and escape of the child into the peritoneal cavity had occurred, it happened that delivery was effected and the woman saved by the operation of turning, the hand being passed through the rupture, the feet of the child seized and brought down, and the delivery completed in the usual way. The fortunate result of these cases gave rise to a very general impression that this was the method of treatment most suitable for such cases, but the gross results of the operation have turned out so unsatisfactory that a very general and growing belief now exists that, whatever may have been the result in rare and favorable instances, the chances of the woman are by this procedure rather diminished than increased. Dr. Barnes believes, and with some reason,

condition of shock and general depression, and the state of the pulse may, on the one hand, indicate that we should not withhold them; but on the other our apprehension of the dreaded, though inevitable, peritonitis is such that we shrink from any treatment which might tend to aggravate that inflammatory action, upon the degree and extent of which the life of the patient will depend, more, perhaps, than upon anything else. It is, in fact, impossible, in this particular, to lay down rules for our guidance; so that we must act, to the best of our judgment, as the exigencies and peculiarities of an individual case may seem to indicate; but it will probably be necessary, in many cases, to rally the patient in some degree from the shock which has attended the accident, before proceeding to perform the operation which we may have selected.

In those cases in which rupture has occurred in the course of pregnancy, the treatment will, in some measure, depend upon the stage of pregnancy. In so far as rupture in the early months is concerned, something must be allowed for the difficulty of diagnosis, as it would be difficult, in such a case, to know whether it was a rupture of the uterus, or of the cyst of an extra-uterine pregnancy. This distinction is not, however, one of any great practical importance, as the treatment in the two cases is probably identical, and there seems no reason to doubt that, in this case, the best chance would be to leave all to nature, in the hope that, by the ordinary process of ulceration, the foetus may ultimately be discharged. When the rupture takes place in the later months of pregnancy, the conditions are quite different, and the indications of treatment are more those of rupture during labor. If we are certain that the foetus has escaped from the uterus, there must be no hesitation here as to the advisability of gastrotomy. For, with an os firmly closed, it would be futile to attempt dilatation of it and the cervix as a preliminary to thrusting the hand through the uterus into the abdominal cavity, so that we cannot here even think of turning. Some have recommended, when the child is still within the uterus, a forced dilatation of the os, and even excision, to be followed by turning; but we very much question whether, even here, it would not be preferable to perform gastrotomy, and extract the child from the womb by enlarging the laceration, should it be necessary. Under circumstances such as these, many would probably prefer trusting to nature.

ble, then, we must be prepared, and nothing will suffice for an intelligent and satisfactory appreciation of these, short of an intimate knowledge of the causes upon which pelvic deformities depend, and the practical contingencies which they involve. Many attempts have, from time to time, been made to classify and reduce these morbid conditions into genera and species, but they have been attended for the most part, in so far as practical results are concerned, with but indifferent success. Many of the best authorities, whom we shall in this matter attempt to follow, abandoning any such scheme, have therefore attached to the conventional phrase, "pelvic deformity," a signification somewhat beyond what its etymology would seem to imply, so as to include, as we shall see, certain cases in which no deformity in the strict sense of the term exists, and yet in which the mechanical requirements of natural labor cannot possibly be assumed to exist. Many of the familiar terms arising from the systems of classification alluded to will be employed in the sequel, but only so far as may be necessary to meet the exigencies of formal description.

The *Causes* of pelvic distortion are various; but by far the most important of these are the diseases known as Rachitis and Malacosteon, which, although closely allied in respect of the morbid condition upon which they depend, are, nevertheless, to be carefully distinguished in regard to the difficulties which they engender, and the effects which they produce on the course of parturition otherwise natural. An elaborate consideration of the pathological conditions, symptoms, and progress of these diseases is altogether foreign to a work such as this; but there are certain points of similarity, and still more of contrast between the two, a knowledge of which is essential to a correct appreciation of the subject in all its bearings, and to which, therefore, it is necessary that we should at this place briefly advert. One of the most essential, and, in regard to our subject, one of the most important points of distinction between rachitis and malacosteon is, that while the former is a disease of childhood, the latter is a disease of adult life; and it is only necessary to compare the form, and degree of inclination of the pelvis of an infant (see Fig. 17), with that of the adult, to see that the effect which must inevitably be produced in the two cases, by a yielding of the osseous structures, can only be attended with results, as regards the measurements and form of the pelvis, which of themselves would suffice to establish a marked distinction between them. Such differences in form as result from the operation of this cause—to which we shall more particularly refer—are by no means the only features which fix our attention in this direction.

Rachitis or Rickets is, as we have said, a disease of infancy and childhood, which very rarely comes on after the age of puberty. It is attended from the first by a marked cachexia, which the best authorities seem to regard as identical with that of scrofula; but the first symptom which clearly points to the nature of the case, is the yielding of the bones, which soon gives rise to more or less of deformity in those parts of the skeleton which have most to do with the support of the body—namely, the spine, pelvis, and lower limbs. The chief morbid alteration

upon which these phenomena depend is a diminution of the earthy constituents of the bones; but the change goes much further than this, and involves corresponding alterations in the animal portion, and thinning of the dense or laminated texture, with a consequent predominance of the cancellated structure, and the formation of certain new and semi-solid products. Some bones suffer more than others, and even some parts of the same bone may be affected to a comparatively greater extent. The amount of deformity which is thus produced will obviously depend, in a great measure, upon the extent to which the disease exists, and the continuance of the morbid conditions referred to; but it is generally observed that the deformity is not confined to any particular part of the osseous framework, but affects it generally, the more conspicuous symptoms being spinal curvature and flexion of the bones of the leg. With the distortion in these regions we have here nothing particular to do; but, as regards the pelvis, there is almost always more or less deformity caused by the weight of the trunk, which is thrown upon the bones of the pelvis from the spinal column through the sacrum. Another important point of special interest to us is that rachitis is usually accompanied with arrest of growth, which, although most marked in the lower limbs, and thus imparting dwarfishness to the frame, is also to be noticed in the pelvis, which is often, on this account, abnormal in respect of size as well as of distortion. We shall not further follow the symptoms and progress of such cases. It will suffice to observe that the general tendency is towards recovery, which is first indicated by an amendment of the general health, disappearance of the cachectic symptoms; and, with more inclination for muscular action, a steady amelioration in the morbid condition of the bones, in which the phosphatic deficiency is gradually improved. Ultimately, the health and strength are permanently restored, but the period of restoration merely fixes the bones for life in the distorted position. Judicious treatment during the period of convalescence no doubt often modifies the amount of ultimate deformity; but such treatment is usually directed to the spine and lower limbs, while the pelvis comes in for a much smaller share of attention. The accoucheur should always remember that the existence of spinal curvature is no evidence of antecedent rickets, a consideration which may be of importance, chiefly with reference to questions of prognosis.

Malacosteon, or Osteomalacia, is much rarer than the preceding, and is essentially a disease of adult life. The process of ossification has, we may suppose, been satisfactorily accomplished; and then come on, for the first time, the morbid conditions upon which the distortion depends. Although in this case, as in that of rickets, the most usual occurrence is a disproportion between the earthy and animal constituents of the bones, their whole structure suffers considerable alteration. It is more frequently observed in females than in males; while in rickets there does not seem to be any preference for sex. The general symptoms which accompany malacosteon are, from an early period of the case, very grave. It usually runs a rapid course, manifests no tendency to repair, defies all attempts at treatment, and, sooner or later,

has a fatal result. The disease may affect the whole skeleton, or may be limited to several bones, or to one; and it would appear that the pelvis at least rarely escapes. It would also seem to involve the entire texture of the affected bones more equably than rickets. Softening of the bones is the usual characteristic, but it may occasionally be attended with brittleness, to which the term *Fragilitas Ossium* has been applied. *Mollities Ossium* is not, therefore, to be accepted as absolutely synonymous with Malacosteon.

In contrasting these two morbid conditions, the first point of importance to be noticed is that, in rickets, we are dealing, not with disease, but with the effects of disease, the pelvis being, in fact, often more dense in structure than if it never had occurred; while, in malacosteon, we have actually existing and progressive disease. From this arises a practical point, which may be noticed here, although with no intention to exaggerate its importance. This is the possibility of some yielding of the bones of the diseased pelvis, so as to admit of parturition, or of operative assistance which would otherwise be unavailable. A case of this kind is given by Osiander, who, being about to perform the Cæsarian section in a malacosteon pelvis, made a final attempt by the hand—an attempt which, owing to such relaxation as is here described, actually succeeded.

The condition and circumstances of the patient at the period of the occurrence are such as to exercise a very important influence on the nature of the distortion. Rickets, in most cases, comes on before the

FIG. 135.

Rachitic pelvis.

child had begun to walk, so that the most likely mechanism of distortion in these instances is a force acting through the spinal column, as we have already observed, upon a pelvis which, in comparison with the adult model, has a greater inclination and a conjugate diameter exceeding the transverse. In malacosteon, on the other hand, the patient may walk or stand during the process of softening, and the weight of the whole trunk is thus transmitted to the heads of the thigh bones. This difference in the nature of the forces or mechanism of pelvic deformity is well shown in the characteristic features of rachitic and malacosteon pelvis. In a typical case of the former variety there is,

the anterior portion is thus drawn out, which is read off in inches marked on the stem. The total length of this instrument, which is also represented in Fig. 143, is about eleven inches.

FIG. 143.

Baudelocque's calipers and Coutouly's pelvimeter.

An immense number of pelvimeters have since then been invented. That figured on p. 443 (Fig. 144), designed by Dr. Lumley Earle, is probably one of the best and simplest; it is to be introduced into the vagina with the shorter of the two limbs turned towards the pubis; and, on the extremity reaching the level of the brim, as ascertained by the finger, along which it is carefully guided, the handles are pressed together, and their divergence read off on the scale which is between them. The objection to all such internal instruments is, that they are difficult of application so as to insure accurate results, and besides not altogether safe unless used with great caution. Coutouly's is, for reasons which are quite obvious, inapplicable to cases in which the woman is in labor, and, indeed, to cases of pregnancy, so that in the very instances in which we are most anxious for exact information, it is practically valueless. Dr. Earle's is, no doubt, from this point of

reach of the finger, the nature of such a case is probably sometimes overlooked at first, as the examiner may conclude, from a simple exploration of the vagina by one finger, that everything is quite normal and that the presenting part will descend presently. In other instances, the obstruction being less in degree, the vault of the cranium passes the plane of the brim, and the head is only arrested when its principal diameters come to be involved; and, in a third class of cases, the obstacle being in the cavity or even at the outlet, labor goes on quite naturally until the head reaches the particular plane at which the obstruction exists.

There is one point, in reference to these cases, in which it is of much importance that we should ascertain the relative condition of the parts involved: this is best expressed by drawing a careful distinction between the terms "impaction" and "arrest," which are sometimes used somewhat loosely, as if the expressions were synonymous. By impaction, we should imply only such a condition of the head as consists in its being actually jammed in the pelvis. In such a case, not only does the head make no advance with the pains, but it does not recede during the interval, so that it is immovable in both directions. In a case in which the head is only arrested, however, there may be an equal impossibility as regards the advance of the head, but its recession during the interval between the pains shows that the period of impaction has not yet been reached—a point which may be of very considerable importance in regard to the probable success or failure of a given operation.

Treatment.—The management of cases of pelvic deformity will be treated of in detail when, in the subsequent chapters, the various operations are considered, the necessity for which arises in a great measure from this particular cause. The accoucheur is occasionally consulted in reference to such cases, at a time when the dangers of pelvic distortion may be averted or modified. If it is a question as to marriage, it may be a very difficult as well as a delicate matter to decide, in a rachitic patient, between celibacy and the possible dangers of pregnancy; but, if the case should be put before us, we must simply advise according to the facts revealed in the course of a thorough examination, when, if there should be evidence of such distortion as would probably call for the operation of craniotomy, it will be proper to withhold our sanction to a marriage under such circumstances. Another possible case, in which prevention rather than treatment may require consideration, is when the woman is pregnant, and the evidence of extreme distortion is clear; or when, in previous pregnancies, labor has only been terminated by the sacrifice of the child. In both of these instances, the question which arises is that of the induction of premature labor, by which alone, it may be, the safety of the mother can be insured. It is generally, however, in the course of labor at the full time that the nature of the case is disclosed, and prompt and decisive treatment called for.

Having endeavored to ascertain, approximately at least, the amount of distortion, we must, in the first instance, decide whether, and if so, to what extent, we should give nature a chance. In the minor degrees

rience, in every eighth or ninth case, it is by no means easy to decide who is in the right. For our part, we entertain a very confident belief that the practitioner who uses the forceps in less than four per cent. of all his cases exposes many of his patients to needless pain and increased risk, and is pretty sure, in his practice, to lose more children in labor than he ought.

When the decision lies between turning and craniotomy, we must first be sure that, if we succeed in turning, the head can be got through the contraction; for it sometimes happens that, after turning, delivery can only be accomplished by perforating behind the ear. It must, therefore, be obvious, that it would be better to perforate and deliver at once, than to turn and then perforate, thereby subjecting the woman to a twofold danger. We must also be able to displace the presenting part without employing much force, so as to introduce the hand into the uterus; and it is certain that, when this cannot be done without violence, it is better at once to desist. One of the most important bearings of this interesting subject is whether the child is alive or not, which may be ascertained by the stethoscope in the usual way. If it is so, the possibility of saving the child,—which has sometimes been done when the general condition seemed little to encourage the hope of such a favorable result,—is the strongest possible inducement we can have for choosing turning, which, at least, gives the child the chance, small though it may be, of which craniotomy necessarily deprives it.

Among the minor arguments which have been used in support of this procedure, may be mentioned the repugnance with which one naturally regards any operation which involves the mutilation of the child, and the use of instruments instead of the hand. And, again, as has very clearly been pointed out by Simpson, there is an undoubted advantage in the manner in which “the transit of the cone-shaped head of the child, through a somewhat narrow brim, is facilitated by the narrow end of the cone (or bi-mastoid diameter of the head) being made to enter and engage first in the contracted brim; and the hold which we obtain of the extracted body of the child enables us to employ so much extractive force upon the engaged foetal head, as to make the elastic sides of the upper and broader portion of the cone (or bi-parietal diameter of the cranium) to become compressed, and if necessary indented, between the sides of the contracted brim.” Besides, the operation of turning, when it can be effected, even after some time, and with some difficulty, is, there is good reason to believe, more safe to the life of the mother than that of craniotomy; so that, even when the child is dead, it is often to be preferred. But, when the child is dead, and turning is unusually difficult or impracticable, we must consent to waive the objections which have just been stated, and substitute craniotomy without delay. This, then, is a question of great practical importance, and is still receiving at the hands of the ablest obstetricians the attention which it merits; but the limits of this work preclude a more extended analysis of the facts which bear upon the subject.

When the pelvic distortion is excessive, and more than one of the diameters is encroached upon to a great extent, as has frequently been observed in malacosteon pelves, it may be quite impossible to deliver

does not appear that the knowledge of the subject was general, even among the most civilized communities, but it is certain that it was well known to the early Arabian physicians. We thus find it mentioned by Avicenna, and more particularly described by Albucasis, who lived about the eleventh or twelfth century. The latter describes two kinds of forceps, the *misdach* and the *almisdach*, both being, according to the Latin version, circular and full of teeth. It is worthy of note that, in the Arab original, which Smellie seems to have seen in the Bodleian library at Oxford, the *misdach* is described as straight, and the *almisdach* as curved. This important discovery was, however, completely lost sight of in the gloom of the dark ages, nor was it till near the middle of the seventeenth century that it was rediscovered, and, after a long interval of secrecy, introduced into practice.

The discovery was made, as Dr. Churchill has clearly made out, by Dr. Paul Chamberlen prior to 1647, and was communicated by him to his sons, who were also members of the profession. The secret seems, however, to have been greedily guarded by the Chamberlen family for their own profit; and Dr. Hugh Chamberlen, who translated into English Mauriceau's work on Midwifery, alludes to it in the preface to that work as late as 1716. Referring to the use of the crotchet, he says: "But I can neither approve of that practice, nor of those delays, beyond twenty-four hours, because my father, brothers, and myself (though none else in Europe, as I know) have, by God's blessing and our industry, attained to, and long practiced a way to deliver women in this case without any prejudice to them or their infants; though all others (being obliged, for want of such an expedient, to use the common way) do and must endanger, if not destroy, one or both, with hooks." As a sort of apology for keeping it secret, he adds: "There being my father and two brothers living that practice this art, I cannot esteem it my own to dispose of nor publish it without injury to them."

The political troubles of his time obliged Dr. Hugh Chamberlen, on two occasions at least, to fly the country and take refuge on the Continent, where he made various attempts to dispose of his invention. His offer to sell it to the French Government was refused, chiefly on account of the failure which had attended his efforts to deliver a woman upon whom Mauriceau had resolved to perform the Cæsarian operation, and which was therefore a case, as we may assume, quite unsuitable for the operation by the forceps. He was more successful, however, in Holland, where he managed to dispose of his secret to several practitioners, of whom the eminent Ruysch, the anatomist, was one. From the Netherlands to Germany, where it was used by Solingen, and ultimately to France, the secret slowly spread, until it was a secret no longer, and was recognized in all its importance by the most accomplished accoucheurs of the day. Long before the operation had thus made its way into notice on the Continent, the secret in this country had undoubtedly oozed out in some quarter; and, ultimately, the midwifery forceps was described and figured by Chapman, in his well-known work, as the instrument used by the Chamberlens. A very interesting discovery was made in the old manor-house of a small estate near Malden, in Essex, which had been purchased by Dr. Peter

Chamberlen towards the end of the seventeenth century, and which had remained in the family till about 1715. In an old chest in one of the rooms of this house there was discovered, in 1818, a collection

FIG. 146.



Sketch of Chamberlen's forceps (Rigby).

of obstetric instruments, along with old coins, trinkets, and the like. Mr. Cansardine, into whose possession these relics had fallen, gave an interesting description of them in the *Medico-Chirurgical Transactions*, vol. ix. There were several pairs of forceps, showing apparently the various stages of advancement through which the invention passed in Chamberlen's hands before he reached what he believed to be perfection. Fig. 146 shows one of the most perfect of these, in which the blades are fenestrated, and are so constructed as, when separately applied, to be articulated together at the shank by means of a pivot. This instrument, as perfected by Giffard and Chapman, is essentially the same as the forceps most frequently used at the present day, except

in so far as the lock is concerned.

Up to this time the handles of all the instruments were, as in the French forceps to the present day, of iron, and the lock was either a pivot, with or without a screw; a sort of mortice lock, like the blades of a pair of scissors; or the blades were clumsily tied together, after their adjustment, by means of a tape or cord. We are certainly indebted to Smellie for the simple contrivance which is known as the English lock, and also for the adaptation of wooden handles, which give a much better hold and purchase. The principle upon which all forceps were essentially constructed was to adjust the curve of the blades with reference only to the spheroidal shape of the child's head, so as to make sure of securing an efficient hold without risk to the child. The difficulty in the application of such an instrument as this, when the head was at the brim or at the upper part of the cavity, led to another important modification of the forceps, the credit of which is divided between Levret and Smellie. It is most likely, however, that the French obstetrician was the real inventor; but it is to be regretted, for the sake of his reputation, that he made a secret of it, as the Chamberlens, to their lasting discredit, had done before.

The novelty in question consisted in the adaptation of a second curve in the blades, with reference, in this instance, to the curved axis of the pelvic canal. This is called the "pelvic curve," and is the invariable form of the French forceps of the present day; while, in this country, the straight forceps has been entirely abandoned by some of the most eminent of our obstetrical authorities. This variety was originally constructed in order to overcome difficulties at the brim and high in the cavity, and it is, therefore, to these that it is chiefly applicable; although, as has been said, many prefer this form in all cases, and allege that it is easier in application, and safer both to mother and child. We do not intend to enter at any length upon the controversy of single *versus*

double-curved forceps; but it is proper to mention that Dr. Barnes, the latest English authority on the subject of operative midwifery, pronounces, in very emphatic terms, in favor of the latter, in all cases, whether at the brim, in the cavity, or at the outlet. For our part, although we cannot subscribe to this doctrine, we are quite confident as to the superiority of the pelvic curve in all cases where the head is at the brim or high in the cavity.

Long and Short Forceps are described by all English writers as distinct varieties of the instrument, and are sold by the makers under these names. The Short Forceps, as usually constructed, is an instrument about eleven inches in length, the measurement from the lock to the tip of the blades being a little over seven inches. Each blade is fenestrated, the aperture being destined, on each side, to receive the parietal protuberances. The blades are curved, so as to measure between their widest part about three inches, and from tip to tip, when closed, not more than an inch. This instrument, when made without a pelvic curve, is known as Smellie's forceps, and is still used in this country more frequently than any other form. When it is applied to the child's head within the pelvis, the handles should be about an inch apart. It is scarcely necessary to observe, what is equally applicable to any variety of forceps, that the blades should be made of steel of the finest temper; otherwise, it is constantly apt to slip over the head by yielding of the metal. The edges are highly polished, and bevelled off in every direction with great care, so as to avoid the possibility of injuring the scalp of the child or the soft parts of the mother. Covering the blades with leather was once practiced, but this has now properly fallen into disuse, as rendering the instrument more difficult of introduction, and more likely to convey infection. Nor is the practice of covering them with a composition of gutta-percha to be commended; and, when properly made, the clean, smooth metal is, on all accounts, to be preferred. The short forceps is admirably adapted for the extraction of the head from the outlet and lower part of the pelvis; but if the head is higher in the cavity, the instrument, although it still may be used with difficulty, is not to be recommended when one more suitable is at hand. Its use is limited to those instances (embracing the greater number of cases calling for assistance) in which it is possible, after adjusting the blades, to close them while the lock is still quite clear of the external parts. If the lock passes within the vulva, there is considerable danger—especially when the woman is under the influence of chloroform, and is thus unable to give any evidence of particular suffering—of pinching in some portion of the soft parts, and inflicting serious laceration.

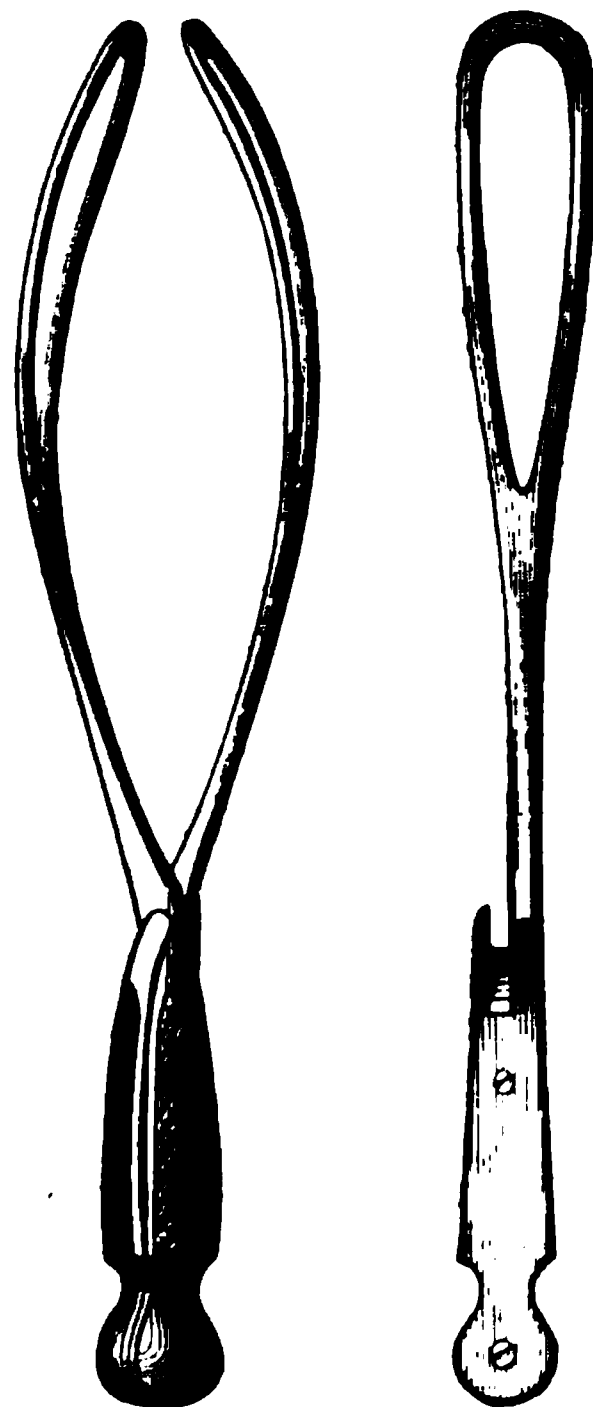
To obviate this risk, and at the same time to render the forceps capable of more extended application, we have always advocated the employment, in ordinary practice, of an instrument which is both longer and stronger than the ordinary short forceps. Such an instrument as this, which fulfils equally well all the purposes of the short forceps, is also applicable to cases in which the head is in the centre of the cavity, or even a little higher. In these latter cases, the lock is still external, and the power of the instrument is considerably in-

more easily introduced with reference to the position of the child's head, if the operator has but one curve to think of; second, the two blades, being the same, no mistake can possibly be made between the upper and lower, or anterior and posterior blade; and third, that if it should be found necessary to alter the position of the head by rotation, this can only be effected by the straight instrument.

The forceps, the use of which we recommend to young practitioners, who generally possess but one, is an instrument of a size intermediate between the ordinary forceps and what will presently be described as the long forceps. It is, as already mentioned, applicable for all the purposes of the short forceps, but by means of it we are able to operate quite as easily when the great diameters of the head are on a level with the middle plane of the pelvis. It is, as represented in the accompanying cut, similar in appearance to the ordinary short forceps, but considerably longer. It is fourteen inches in length, the blades to the lock being nine, and the handles five inches. The fenestræ are four and a half inches in length, and something less than an inch and a quarter in the widest part. The distance between the blades in the widest part of the curve is three inches, and at the tips a little under an inch. The handles are lengthened to secure a better hold,—an advantage which is unimportant, if not questionable.

Cases requiring the use of the forceps are very variable in their general features, but most of them may be referred to one or other of the following groups. We may have, in the first instance, cases in which everything is normal save expulsive power, which may utterly fail as the period of delivery approaches: this failure of the *vis a tergo* is familiarly known as “uterine inertia,” and from it arises, more frequently than from any other cause, the necessity for operative assistance. In another group, the operation is rendered necessary by a minor degree of pelvic deformity, at the outlet or in the cavity, of which flattening of the sacrum is an example, probably of more frequent occurrence than is usually supposed. In occipito-posterior positions and in face presentations, the forceps may be found necessary either for rectification or direct extraction; and, in convulsions, or any other condition calling for speedy delivery, it may be necessary to use the forceps if the labor has sufficiently advanced to admit of the safe application of the instrument. Some of the rarer circumstances calling for the forceps have already been mentioned, such as certain cases of rupture of the uterus, placenta

FIG. 147.



Straight forceps for ordinary use.

measure obliterated the landmarks on the surface of the cranium, it is really important that we should seek for and observe the ear, with the view of determining the exact position of the head. But to accept this as a rule for our guidance in every case, is both unnecessary and improper, as the ear, in some cases in which we may hold the operation to be perfectly justifiable, can only be reached with difficulty or with an amount of violence which may greatly aggravate the sufferings of the patient. To these we might add other conditions, which have been prescribed as essential to the safe performance of the operation, but which have deservedly fallen into neglect.

The forceps must be applied directly to the surface of the child's head, and it is therefore absolutely necessary that the membranes be ruptured, should this not already have spontaneously occurred. We have been summoned with a view to delivery by the forceps in a case in which it was stated that the os was fully dilated, although it turned out that the os was very slightly dilated and only reached with difficulty in the posterior part of the pelvis, the thin uterine wall being still extended over the surface of the scalp. Such a condition could, with ordinary care, scarcely lead to an error in practice, but the possibility of a mistake should nevertheless be borne in mind by the inexperienced.

If possible, but with exceptions to be afterwards noticed, the blade should be applied to the sides of the child's head. To do this with accuracy, it is necessary that the actual position of the head be made out with perfect certainty. This may be ascertained, as has been explained in a former chapter, by a careful examination of the sutures and fontanelles, and of the relation which these parts bear to the pelvic canal; and, as there are four possible cranial positions, we must first be sure with which of them we have to deal, before we ever take the instrument into our hands. It is only, as we have said, when exceptional difficulties exist that we require to examine the ear. No one, therefore, is qualified to attempt delivery by the forceps unless he is familiar with the laws which regulate normal parturition; and there is, in fact, no operation or contingency in midwifery practice, in which a thorough knowledge of the mechanism of labor, in all its details, is so essential as this. It is unnecessary to inform any one familiar with the details of normal parturition, that the method of application will depend upon the situation of the head. In proportion to the proximity of the head to the external parts will the movement of rotation be found, in the ordinary position, to have occurred; and, therefore, the nearer it is to the outlet, the more will we require to apply the blades in the transverse diameter of the pelvis, in our endeavor to adjust them to the sides of the head. When, however, the head is higher, its position is more decidedly oblique, and, even at the outlet, a little of this obliquity still obtains; so that, to insure their application to the sides of the head, we must apply them *in the opposite oblique diameter to that in which the child's head lies*.

Having satisfied ourselves as to the position of the head, and that the conditions exist which warrant the performance of the operation, we prepare the forceps by warming and greasing the blades. The

When the head occupies the second cranial position, the forceps must be applied in the right oblique diameter. The lower blade is therefore introduced in the direction of the left foramen ovale, from which point the handle is first directed upwards and to the left, and then depressed downwards and to the right. The upper blade is then introduced in the direction of the right sacro-iliac synchondrosis, taking care that it is passed in front of the lower blade, and that the metallic surfaces of the handles retain their parallelism as before. In third positions, the forceps must be applied in exactly the same way as when the head is in the first; and in fourth presentations as for the second.

CHAPTER XXIX.

THE FORCEPS (CONTINUED).

ACTION OF THE FORCEPS: 1, BY COMPRESSION; 2, BY TRACTION; 3, BY DOUBLE-LEVER ACTION—MODE OF EXTRACTION: MANAGEMENT AND DIRECTION OF THE HANDLES AT VARIOUS STAGES OF DELIVERY—DELIVERY BY THE FORCEPS IN OCCIPITO-POSTERIOR POSITIONS: ROTATION BY THE FORCEPS: EXTRACTION WITH THE FOREHEAD FORWARDS—THE LONG FORCEPS—REASONS FOR PREFERRING THE PELVIC CURVE IN THIS OPERATION—DESCRIPTION OF THE INSTRUMENT—CASES IN WHICH THE LONG FORCEPS IS APPLICABLE—DIRECTIONS FOR THE OPERATION: BLADES TO BE APPLIED TO THE SIDES OF THE PELVIS: MODE OF INTRODUCTION OF THE LOWER AND UPPER BLADES: RELATION OF THE BLADES TO THE SURFACE OF THE CRANIUM—USE OF THE FORCEPS IN PRESENTATION OF THE FACE—PROCEDURE WHEN THE HEAD IS RETAINED AFTER EXPULSION OF THE TRUNK—MODIFICATIONS OF THE INSTRUMENT: ZIEGLER'S FORCEPS: RADFORD'S FORCEPS..

THE forceps acts mechanically in three different ways in effecting the object which we have in view: by compression, by traction, and by a double-lever action. In so far as Compression is concerned, a certain degree of this is essential, in order to grasp the head with the blades, which otherwise would slip off, or would only be precariously maintained in their position, under certain circumstances, by the pressure of the walls of the parturient canal. But, by compression, something more is implied than mere grasping; for by it, as is obvious from the yielding nature of the sutures and fontanelles, the actual diameters of the cranium may be materially diminished. It is to be remembered, however, that the forceps is usually applied to that portion of the cranium which is least subjected to pressure, and that, therefore, as a rule, little is to be gained by diminishing these diameters. We may, in fact, assume that the pressure which is necessary to insure such a grasp of the head as may render it impossible for the blades to slip under moderate efforts, will effect all the compression which is desirable. Many recommend that a piece of cord or tape should be firmly tied round the handles in order to keep up sustained pressure on the cranium, and it is for this that the depression near the extremities of the handles, which is characteristic of all English forceps, is intended.

extremities is more than an inch. So soon as he feels that his fingers are leaving the surface of the scalp under the influence of his efforts, he knows that the instrument is losing its hold. The blades should then be disarticulated and pushed back to their original position; and, upon renewed efforts, he makes use of a little more compression, thus striving always to effect the dislodgment of the head with as little of actual force as may be necessary. The force should be applied as nearly as possible in the direction of the axis of that part of the pelvic canal within which the head lies; and the operator should act by combining steady traction with a swaying motion of the handles from side to side.

If the head is by these efforts dislodged from the situation in which it has been arrested, and moves downwards into a lower plane of the pelvis, this may, in the presence of efficient pains, be all that is required, as nature will often in such cases complete the delivery. It is better, however, at this stage, not to withdraw the blades, but merely to disarticulate them, and, leaving them in contact with the head, watch the result. If the head now moves satisfactorily with every pain, they may be entirely withdrawn; but, so long as there seems a probability of further assistance being required, it is better to leave them than to run the risk of having again to apply them at a more advanced stage of the labor. If it is a case of inertia, or when there is obvious obstruction at the outlet, our efforts must be continued at intervals as before; resting satisfied with a very gradual advance, and never (unless under exceptional circumstances, when rapid extraction is imperatively demanded) striving for a speedy termination of the case, which might endanger the perineum and the other soft structures which nature in normal cases very gradually distends.

The direction which, in labor, the head naturally takes is always to be kept in mind. As it descends, therefore, if it has originally been in the cavity when the blades were introduced, the handles are to be carried forwards under the arch of the pubis, and, at the moment of birth, are to be raised in front of the symphysis. It is at this moment that precipitation or violence of any kind is so apt to lacerate the perineum, so that we should, by every means in our power, closely imitate the process by which nature so admirably effects the dilatation of this structure. It is usual to practice what is called support of the perineum, in forceps as in ordinary cases; but in such means, as a preventive of laceration, we have, for reasons already stated, no confidence whatever. As the head passes from the cavity to the outlet, the natural movement of rotation is not to be forgotten. It is not, indeed, necessary that we should attempt artificially to produce this rotation. Under the influence of the ordinary causes, nature will effect it at the proper time, whereas we might only do harm by misplaced efforts before that time has arrived. Still, it is proper that we should watch the first indications of rotation, and, in our subsequent endeavors, "humor" the blades so as in every way to encourage it.

The situation on the sides of the child's head which corresponds to the blades, varies considerably, and will depend, in some measure, on the degree of moulding, or elongation, which may have occurred. When successfully applied, so as to obtain the best possible hold, the tips

blades, if of proper material, to be of great thickness, but the handles should always be large, of sufficient size, indeed, to be firmly grasped by both hands. Endless varieties and modifications of the long curved forceps have been devised, and it is but natural that every operator should prefer his own. The instrument here shown is somewhat similar to what is known in this country as Simpson's forceps, which was adopted by him from the pattern of those used by Naegele and other German accoucheurs. The joints are made so loose as to admit of a certain degree of lateral motion or overlapping, and below the lock there are transverse rests for one or two fingers of the right hand to drag by; "the long forceps," as Simpson observes, "being only properly used as an instrument of traction, not of compression." The length of the instrument which we have represented here is sixteen and a half inches, being ten and a half inches from the lock to the tip of the blades, and six inches for the handles. The measurements between the blades should be the same as those of the medium-sized instrument above described, and the fenestræ about five and a half inches in length. The instrument is thus, as is believed, both longer and of greater strength than those which are generally employed by English practitioners. It is inferior in efficiency to none, and is, if used with due caution, equal in point of safety to any. No one should, under any circumstances, take the long forceps into his hands without a sense of responsibility much greater than attaches to the ordinary operation.

The long forceps, as will now be understood, is applicable to cases in which the head will not enter the brim or descend beyond the upper part of the cavity. The cases which are held to warrant its employment are chiefly those in which the head is arrested at the brim by reason of moderate contraction of the conjugate diameter. Great care must therefore be taken, in the first instance, to ascertain the degree of deformity, and to make sure that the case is really one in which the forceps may be used with a reasonable prospect of success; for, if not, nothing can be more irrational than to subject the woman to the not inconsiderable risk which attaches to this operation, even under the most favorable conditions. When the child is dead, and the estimated difficulty in extraction considerable, most accoucheurs will prefer to deliver by craniotomy; but if, on the contrary, there is evidence of the child being alive, nothing can be more repugnant to the feelings than the idea of an operation which deliberately destroys a life, and we will naturally prefer any procedure which may give the child a chance. To yield too far to this inclination would, however, be manifestly wrong, for the mere fact of the child's life need not enter into the calculation when it is obvious that it must, sooner or later, be sacrificed. Our whole attention, in such a case, should be centred in the mother, in whose interests, therefore, we should decide upon that operation which is likely to subject her to the least possible risk.

But it is not against craniotomy alone that the long forceps may be balanced, for there are cases in which the question for decision is between the forceps and turning, as will be better understood when we come to consider the conditions under which we have recourse to the latter operation. It has been said that the forceps is a "child's operation,"

but we would take a very narrow and improper view of the scope of the instrument did we conclude that it was always so, and that it was inapplicable in the interests of the mother. The results of craniotomy are, according to Churchill, about one maternal death in five, and we may be sure that when the head is high in the pelvis the figures will be more unfavorable still. Nothing can be more absurd, therefore, than to assume that, in so far as the mother is concerned, craniotomy and the long forceps stand to each other in the relation of safety and danger; and yet it would almost seem that this was the idea which prompted many, even in modern times, to declare in favor of the former.

The operation by the long forceps is one to which, as a rule, a considerable amount both of difficulty and danger is attached. This arises from the peculiar circumstances of the case, as compared with the ordinary forceps operation. There can scarcely be a stronger contrast than between a case requiring the application of the short forceps, when the head lies upon the perineum, and is arrested by simple inertia, and one in which a contracted brim prevents the head from entering the pelvic canal. In the one case we have the operation in all its details so thoroughly within our control, that we almost cease to look upon it with the slightest apprehension. In the other, we are operating comparatively in the dark, and at great mechanical disadvantage; we have to subject, to an extent which we cannot fully be aware of, delicate textures to violent compression; we have to drag the head through the whole length of the pelvic canal instead of merely disengaging it from its proximal extremity; and, finally, we have to determine between the amount of actual obstruction and the degree of justifiable force, with a nicety upon which success or failure will depend. Is it, then, to be wondered at that the operation is looked upon with apprehension as one beset with difficulties and dangers?

While we freely admit that the objections with which delivery by the long forceps is beset are in themselves sound, we must, at the same time, express our conviction that they have been in some degree exaggerated; and that, when skilfully and warily employed, the best results will, in some instances, follow from its use,—the one essential element which, above all others, will contribute to success, being a careful selection of proper cases. It is now very generally believed, by those who have had the greatest experience, that a large proportion of the unfortunate results depend upon improper instruments, and especially upon the use of such as are deficient in power. The observations which, on this point, we have already quoted from Dr. Barnes apply here with peculiar force. Power and control are correlative factors towards the attainment of the result which we desire, and if there is a deficiency in the former we can have but little confidence in the issue of the case.

As regards the mode of application, the long forceps differs in many essential particulars from the short. Exceptional cases may no doubt occur, in which the forceps is applied at the brim to effect delivery, which is called for in consequence of inertia, hemorrhage, and the like; but in such cases (in which we may assume the pelvis to be of normal dimensions) the operation of turning will generally be preferred. Delivery by the long forceps may practically be considered as an operation

in which the head is arrested by reason of contraction of the pelvic brim. Our object, then, is, not to apply the blades in the opposite oblique diameter of the pelvis to that occupied by the child's head, so as to secure their adaptation to the sides of the cranium, but rather to introduce them with special reference to the pelvic walls, so as to be sure that each passes along the side of the pelvis, and is thus opposite to the other in or near the transverse diameter of the brim. When the head is still above the brim, it usually occupies, as we have seen, a position which is more transverse than usual, and the effect of conjugate contraction at this part is to maintain that position even after the head has actually engaged in the brim. Were we here to follow the usual rule, and did we succeed in applying the blades in that way, their grasp would be in the conjugate diameter, and in every effort we would run the risk of subjecting the soft parts of the mother to injurious pressure between the blades and the poles of the conjugate measurement, the chief danger being posteriorly against the projecting sacral promontory. Consequently, we must discard all preconceived ideas and rules, and pass the blades in the direction in which there is most room.

The patient may here also lie on her left side; and there is this advantage in the double-curved forceps, that there is not the same necessity for bringing the hips over the edge of the bed, as from the nature of the pelvic curve the handle of the upper blade does not require to be nearly so much depressed. The rules given for the introduction of the blades in these cases vary considerably. We prefer, as in the case of the short forceps, to pass the lower blade first. Some operators,

FIG. 152.

Introduction of the long forceps.

following the advice of Madame Lachapelle, will pass this blade along the sacro-sciatic ligament; but the most experienced of modern operators prefer to pass it over the perineum into the hollow of the sacrum, a little to the left of the middle line. If the former method be practiced,

handle must be directed somewhat to the right, although much less than in the case of the straight forceps. If, on the contrary, the operator should select, as we would recommend, the second process, the blade may be directed, as is here shown, pretty nearly in a horizontal position, into the hollow of the sacrum. That the introduction of the de-curved forceps is a more complicated proceeding than the operation previously described, no one will dispute; and this indeed will appear from the description of this stage of the process given by Dr. Barnes: "As the point of the blade," he says, "must describe a double compound curve—a segment of a helix—in order to travel round the head-globe, and at the same time to ascend forwards in the direction of Carus's curve so as to reach the brim of the pelvis, the handle goes backwards, and partly rotates on its axis. The handle is carried backwards and downwards to complete the curve of the blade around the head-globe, and into the left ilium. Slight pressure on the handle ought to suffice. This will impart movement to the

FIG. 153.

Diagram showing various stages in the introduction of the long forceps (lower blade).

; the right direction will be given by the relation of the sacrum to the head." Dr. Barnes further illustrates this by the above diagram (Fig. 153), which we have slightly modified.

The actual introduction of the blade is by no means so difficult, nor is it a matter of such nicety as the above description would seem to imply. The mere raising of the handle, after the blade has been so far introduced, causes it to glide upwards, unless some obstacle should exist to impede its progress. When thus adjusted to the side of the head, the weight of the handle will tend to keep it in position, but this will be more certainly effected by intrusting it to an assistant, who should hold it back towards the perineum to facilitate the introduction of the upper blade. As in the case of the other, this blade may also be passed in the direction of the hollow of the sacrum, and is carried in front of the lower blade, but somewhat to the right of the middle line. The handle being now depressed and carried backwards, its movement directs the blade along the convexity of the child's head towards the right ilium; and, when the movement is complete, the handles should be in apposition and lock easily. Success in this will, however, depend upon the extent and nature of the distortion, but if the lateral walls of the pelvis are normal as regards their various planes, no great difficulty, after a little practice, will be experienced in the introduction and adjustment of the long forceps. The locking of the blades may be looked upon, not only as evidence that the blades are in contact with opposed surfaces of the head, but also that the case is one in which we may hope for a favorable result. But if, on the contrary, we do not succeed in introducing and locking the blades after one or two attempts carefully conducted, we must abandon the case as one unsuitable for the operation.

It is assumed by many writers that the blades, when introduced, correspond to the antero-posterior diameter of the head. It is not so, however. The head, indeed, very generally occupies the transverse diameter of the pelvis, but the tendency of the blades is to adapt themselves to one or other oblique diameter, as has been shown by Simpson. This has been conclusively established by examination of the head, after delivery by this process, when it is found that one blade has passed behind the ear, and the other has reached over the frontal bone on the opposite side, and has been applied over or in the immediate neighborhood of the orbit, as in the position here indicated.

The forceps being thus applied, the next step in the process is an attempt at extraction. Remembering the power which we possess in so formidable an instrument as this, we must, in the first place, exercise great caution in the matter of compression; and this point is all the more necessary as the handles will be found to gape more than is usual, owing to the length of the cranial diameter which is between the blades. Moderate compression is all that is necessary to maintain the position of the forceps when well applied, for we know that it is not by manual compression only, but also by compression of the blades by the walls of the natural passage, that their grasp is sustained. The handles are to be seized by both hands and steady traction practiced, the direction at first being somewhat backwards. As in case of the ordinary forceps, the traction must not be continuous, but in aid of present, or in imitation of absent pains; and at the same time we combine with

mere pulling effort a moderate degree of the swaying or double-lever action, taking great care not to injure the perineum.

FIG. 154.

The long forceps applied.

The thorough control which the size of the handles gives us over the instrument enables us to perceive with greater accuracy whether or not the head can be dislodged by such efforts as we are justified in making. This may be more exactly ascertained by passing the finger from time to time in the direction of the head, when the descent of the occiput or the rotation of the sagittal suture towards the conjugate diameter may afford clear evidence that the head is making progress. As it descends, the handles of the forceps will be observed to rotate, and in some cases it may be possible to assist the rotation. When this stage has been reached, it will be proper to carry the handles more forwards, and to pull rather downwards than backwards, following the curved axis of the pelvic cavity. Finally, the operator must carry the handles forwards and upwards in front of the symphysis; and, in order that this may be effected with ease, the right thigh should be raised by the nurse, or the patient may be laid on her back, so as to permit the handles to move upwards in the direction of the umbilicus. The operator must, however, beware of moving the handles prematurely in this direction, as he may thereby do mischief. And there is another danger which he must specially avoid, viz.: the ploughing up of the perineum by the blade, which, in consequence of the rotation, is now turned against it. This may, no doubt, be avoided by disarticulation of the blades as the head approaches the outlet; but, as it is often necessary to continue the traction to the last, extreme caution must at this stage be observed. In nothing should we be more particular than in the slowness and deliberation with which we conduct the various

tion is without risk, and nothing, therefore, short of a conscientious conviction that he is about to act in the interests of the mother or the child, can ever absolve him from the responsibility which attaches to him in virtue of the position which he occupies.

CHAPTER XXX.

THE VECTIS; FILLET; BLUNT HOOK; &c.: DECAPITATION.

DISCOVERY OF THE VECTIS BY ROONHUYSEN—MODE OF USING THE VECTIS—CASES TO WHICH IT MAY BE APPLIED—THE FILLET; A CONTRIVANCE OF ANCIENT ORIGIN; APPLICABLE CHIEFLY TO BREECH CASES—THE BLUNT HOOK—THE CROTCHET: PRECAUTIONS NECESSARY IN THE USE OF THE CROTCHET: THE GUARDED CROTCHET—USE OF TWO CROTCHETS—DECAPITATION; VARIOUS INSTRUMENTS FOR; DESCRIPTION OF THE OPERATION: EXTRACTION OF THE TRUNK: SUBSEQUENT EXTRACTION OF THE HEAD BY THE VARIOUS METHODS OF THE FORCEPS, CROTCHET, OR CEPHALOTRIBE.

ABOUT the same time that the discovery of the Chamberlens was gradually brought to light and introduced into practice in this country, the Vectis or Lever was being used for the delivery of women in Holland by Roonhuysen. The frequent sacrifice of infant life—which was rendered necessary in cases of difficult or obstructed labor—was no doubt the cause which, in both cases, turned the attention of the inventors to the subject, with the earnest desire to devise any means whereby the crotchet and perforator might be superseded by some contrivance which would deliver the woman without destroying her child. The discovery of Roonhuysen, although of much less importance than that of Chamberlen, was an unspeakable advantage in practice; and by the rude instrument contrived by the Dutch accoucheur, many successful operations were performed by himself, his sons, Ruysch, and some others to whom the secret had been communicated. This original lever was of the simplest possible construction, and consisted of a flat piece of iron, bent at each end into a slight curve, and covered with soft leather to protect the external parts. The secret of the lever was eventually purchased from those to whom it had been handed down after Roonhuysen's death, by two Dutch physicians, Visscher and Van den Poll, whose names are more worthy of being recorded than those of the inventors, as they jointly paid the sum of 5000 livres in order that they might impart to the world a secret which should never have been withheld. As the knowledge spread, the simple contrivance of the originators became altered and modified, until it resulted in the vectis of the present day.

One is apt to suppose, that as the Vectis is now seldom used, it has been discarded as a worthless instrument. So far, however, from this being the case, the vectis must always be looked upon as an extractor of considerable power and efficiency, and the sole reason for the neglect

position of the head be accurately ascertained; and further, that the operation should be conducted with a perfect knowledge and appreciation of the laws upon which the natural phenomena of parturition depend: the object being chiefly, therefore, to bring the occiput forwards under the arch of the pubis. If we should thus succeed, by pulling down the occiput, in increasing the occipito-frontal obliquity of the head, it is clear that we are, at the same time, closely imitating the process by which nature manages the descent of the head. This may, if the uterus is acting efficiently, be all that is required; and, in any case, it advances matters a stage. But in cases of unusual difficulty or absolute inertia, little ultimate good will result if we stop short at this stage of the operation, so that we can only act effectively by bringing our force to bear against the two ends alternately of the occipito-frontal diameter. So soon, therefore, as we have succeeded in causing the occiput to advance, the vectis is to be withdrawn and adjusted to the frontal pole; and by thus acting, now on the occiput and again on the forehead, we may certainly and steadily cause the head to advance in the direction of the outlet. A blade which is sharply curved will, no doubt, take a firmer hold of the part to which it is applied; but this advantage is probably more than counterbalanced by an increased difficulty in its introduction. It is for this reason that a more gentle or wider curve has been generally preferred, which, while permitting of easier introduction, makes it more necessary that the blade itself should be used as a lever; and, indeed, some have gone so far as to say that no vectis can possibly be better than a single blade of the straight forceps.

It would appear that the cases in which the modern accoucheur may, with advantage, have recourse to the vectis are those in which his primary object is to act upon the occipito-frontal diameter of the head. Should it seem, therefore, that all that is necessary is to insure the descent of the occiput, it is possible that delivery may thus be effected with even more safety than by the forceps, where the action bears upon the poles of the transverse diameter. Contingencies may also arise, in the course of many operations in midwifery, in which the operator might avail himself of the vectis if it were at hand; but it is probable that in no instance is the vectis more applicable than when we wish to correct malposition of the vertex. The natural process, by which occipito-posterior positions of the vertex terminate by rotation, has already been fully described; and it has also been observed that an essential condition to such rotation is the descent of the occiput, along the posterior pelvic wall, while the forehead remains high in the direction of that cotyloid cavity to which it is turned. In proportion, therefore, as the forehead descends (*fronto-cotyloid* position of West) along the anterior wall, the more do we despair of natural rotation, and look with apprehension to the probability of a tedious labor, or a birth with the forehead to the pubis. Much may, as we have shown, be done by the fingers of the operator directed against the frontal end of the occipito-frontal diameter; and, indeed, while propulsive effort exists, nothing is so likely as this to encourage descent of the occiput. But when this procedure fails, we have in the vectis a powerful auxiliary,

but the objection to that instrument, as has already been stated, is the injury which may, by its use, be inflicted upon the groin and genital organs of the child. The fillet may, however, be substituted, and employed both with safety and efficiency. A simple loop or noose, as was the nature of the original fillet, is, in such instances, to be passed over the flexure of the thighs, by means of the fingers, an elastic catheter, or (as has been suggested) the instrument which was designed by Belocq for plugging the posterior nares. Nothing serves the purpose better than a simple skein of worsted, one end of which is introduced in this way, and the other extremity then passed through it so as to form a running noose. This noose may, again, be adjusted so as to direct the extracting force in the proper manner; and, as our object generally will be to pull down that hip which is turned forwards in the pelvis, in advance of the other, the noose should therefore be placed nearly over the anterior ischial tuberosity.

The Blunt Hook, which is here shown, is also an instrument of ancient date. It has been recommended in cases of obstructed breech delivery; but the danger of wounding the soft parts of the child which it entails, is now very properly held to be such a serious objection to its use, that it has been entirely discarded in cases where there remains a possibility of the child being alive. In all cases in which the child is ascertained to be dead, the blunt hook may be used without hesitation; and, in these cases, it is a powerful auxiliary to many of the more important operations of midwifery. It is, however, less an instrument adapted to any special operation, or operations, than one which may be useful in a hundred different ways, while we are attempting to extract the child in cases of unusual difficulty. It acts most powerfully when hooked into the flexure of a joint. In this way, as we have seen, powerful extracting force may be brought to bear, when the breech presents, by passing it over the groin; and, in like manner, in cephalic presentations, the shoulder may be made to advance by tractile effort of a similar kind brought to bear upon the axilla. But while these are, perhaps, the circumstances under which the blunt hook is most frequently and usefully employed, it gives no idea of the real scope of the instrument. This, indeed, embraces points in the detail of many of the chief operations of midwifery; and, in the forcible extraction of the child, after the performance of craniotomy or embryulcia, the hook is almost indispensable. Its advantage, as compared with the crotchet, is that, as there is no necessary laceration attendant upon its employment, it is not absolutely unsuitable for the delivery of a living

FIG. 159.

The blunt
hook.

FIG. 160.

The
crotchet.

one time fixing it in the foramen magnum, and at another attaching it to the spinal column, or the pelvic brim.

The nature of the crotchet is such that it can operate upon one point only of the circumference of the head, or other presenting part. If we act, therefore, in an ordinary cranial position, in this manner upon the orbit, we run the risk of dragging down the forehead by a movement of the head on its transverse axis, without securing any actual advantage, and with the possibility, if the chin be backwards, of making matters worse. *Ætius*, in one of the most interesting passages of his obstetric works, recommends that we should operate by two crotchets, applied at the side of the pelvis, to opposite surfaces of the child's head, and then pull downwards, in order that the traction may be equal, and in the direction of the resultant of the two forces (*ad neutram partem declinans*). Had he but thought of the possibility of applying the same principle to the delivery of the living child, he would almost inevitably have discovered the forceps. But, as in the case of Hippocrates and the olive, such speculations are perhaps more interesting than instructive. The hint here given, as to the combined action of two crotchets, is not to be despised, as there are certainly cases in practice in which the principle indicated might usefully be adopted; and this, in fact, was recommended and practiced by Dr. Davis. In so far as cranial positions are concerned, in which the forceps fails, or in which the use of that instrument is contraindicated, no good can possibly result, except under peculiar or exceptional circumstances, from the use of the crotchet, until we have already diminished the head by perforation of the cranium, and extraction of its contents.

Decapitation.—An instrument closely resembling, in shape and general appearance, the blunt hook, but which is generally sharp within the curve, has been used with success in the treatment of those difficult cases of transverse presentation in which the ordinary methods of treatment have failed. This operation simply consists in abridging the long diameter of the child by a section made at the neck. It is described by Celsus, and by many writers subsequently, but, with the exception of Davis, Ramsbotham, and, more recently, Barnes, the subject has not received that attention in this country which it seems obviously to merit. It seems to us advisable, therefore, that we should in this place describe the operation somewhat in detail. This mode of procedure is chiefly applicable to those instances in which we have to deal, either with a neglected case of shoulder presentation, where the body of the child is partly impacted, or is so tightly embraced by the uterus as to render turning impracticable; or with a case in which the difficulty arises mainly from pelvic distortion, complicated with a transverse position of the child.

The form of hook already described is that which is best known in this country, and is commonly called Ramsbotham's hook; but a number of other instruments, more or less resembling this, as well as some of a different construction, have been recommended. Among the latter may be mentioned a contrivance which consists of a strong cord, which is to be passed round the neck, and then, by a saw motion, is carried to and fro by means of cross handles at its extremities, until

head, if completely separated, will move to the side, and will be no obstacle to the passage of the body.

The extraction of the head of the child, which constitutes the third stage of the procedure, is by no means an easy operation, and is sometimes, in fact, the most difficult point of all. A good deal will depend upon the condition of the uterus as regards contraction. During the second stage it will be the duty of an assistant to keep up steady pressure upon the fundus of the uterus, and to follow it downwards as the trunk is being gradually expelled, so as to encourage, as far as may be possible, efficient and symmetrical uterine contraction, under the influence of which the head will be grasped, forced down in the direction of the cavity, and maintained in a comparatively fixed position. Another condition likely to exercise an important influence is the state of the head itself, which, if decomposition has advanced, will be easily compressible, the flat bones being so loosely connected with each other as to admit of overlapping to a very unusual extent. Various methods have been suggested and practiced for the extraction of the head from the uterus. The instances in which it is expelled by the natural efforts are few, and no confidence can, for obvious reasons, be placed in the occurrence of such a result. In some cases it has been successfully removed, when compressible from putrefaction, by the fingers of the operator; but in almost all ordinary cases instrumental aid is required, when we have the forceps, the blunt hook, the crotchet, and the cephalotribe to select from.

The great obstacle, in such cases, arises from the mobility of the head, which rolls about within the cavity, and can sometimes only be seized with difficulty. If, however, the head can be steadied and pressed downwards by the assistant, whose hands are employed for this purpose in the hypogastric region, the difficulty in question may be overcome. If it be possible to fix the crotchet, or a small blunt hook, in the foramen magnum or orbit, success may, in this way, with the aid of the fingers, be quite practicable; but the risk of the crotchet slipping is so considerable, that the more experienced modern operators have pretty much discarded that instrument in favor of the others which have been mentioned. The safest and most satisfactory operation, when it is practicable, is that by the ordinary midwifery forceps. The difficulty in this, as in the other operation, is to fix the head; for, as soon as one blade is introduced, the head may escape to the upper part of a relaxed uterus, or to either side, so as completely to elude the grasp of the blades; but if we can succeed in seizing the head, either antero-posteriorly or laterally, delivery will usually be completed without any further obstruction. The only other point to which it is necessary to pay particular attention, is the adjustment of the blades in such a manner as may obviate the possible danger arising from jagged spiculæ, which may project from the severed vertebræ, or from such splintering elsewhere as may possibly have been the result of previous operative efforts.

There are cases, however, in which much more serious difficulties attend the extraction of the retained head. The worst examples of this are instances in which there is pelvic deformity, and in which it may

quite unjustifiable, even should he succeed in his endeavor, seeing that he has, in the forceps and the perforator, agents by which maternal risk is materially reduced. As an illustration of what ignorance and humanity may achieve under the seal of the profession, we may here mention the details of a case of this kind, which was brought under our notice many years ago. A young practitioner in a remote country district having performed the operation of turning, experienced such difficulty in getting the head through the brim that he called in the aid of a friend of no greater experience than himself. Under the influence of vigorous efforts thus reinforced, the body of the child was brought into the world minus the head. The removal of the retained head was too much for the combined skill of the two operators, so that, after repeated failure, they held a council; and, after due and solemn consultation, resolved to perform, and actually did perform—what?—the most ingenious and speculative of our readers can scarcely conceive it—the *Cæsarian Section*!

CHAPTER XXXI.

TURNING.

VARIOUS METHODS OF TURNING: TURNING AS PRACTICED BY THE ANCIENTS: PODALIC VERSION—CIRCUMSTANCES WHICH CALL FOR, AND CONDITIONS FAVORABLE TO THE OPERATION: THE OPERATION IN DETAIL: CHOICE OF HANDS: INTRODUCTION OF THE HAND: PASSAGE OF THE OS: SEIZURE OF A FOOT OR KNEE—CIRCUMSTANCES WHICH RENDER TURNING DIFFICULT: DIFFICULTY IN SEIZING THE FOOT—CHILD TO BE TURNED FORWARDS—MANAGEMENT OF THE CASE AFTER VERSION—PELVIC VERSION—CEPHALIC VERSION—TURNING IN CONTRACTED PELVIS: DEGREE OF DISTORTION WHICH MAY ADMIT OF TURNING—TURNING CONTRASTED WITH THE LONG FORCEPS, AND AS A SUBSTITUTE FOR CRANIOTOMY—SPECIAL DIFFICULTIES—BIMANUAL OR BIPOLAR VERSION: PROCESSES OF WIGAND, LEE, AND BRAXTON HICKS.

THE operation of Turning, in its most extended sense, implies a manœuvre by which one of the poles of the long diameter of the child is brought into the brim of the pelvis, the long diameter of the foetal oval being thus made to correspond to the long diameter of the uterus. Two varieties of turning may therefore be practiced: these are turning by the head, or, as it is generally termed, Cephalic Version; and turning by the feet, or Podalic Version. A special modification of the latter, in which the breech, and not the feet, is brought down, has been occasionally practiced, and separately described.

From the time of Hippocrates down to the middle of the sixteenth century, Cephalic Version was almost exclusively practiced, the head of the child being assumed to be the only natural presentation. This assumption led to the frightful practice of turning by the head in all presentations of the pelvic extremity. It is quite clear that both

operation is then found to stand in a very different category. The condition of the os as regards *dilatability* is another most important consideration, for a rigid or unyielding condition of this part of the passage is justly looked upon as an unfavorable circumstance, and it is therefore proper to wait, so long as the membranes remain unruptured, until nature overcomes this resistance.

The Operation.—The condition of the bladder and rectum having been attended to, the woman is, in the first instance, to be placed in a convenient position. Some operators prefer that she should be on her back, and others that she should be on her elbows and knees; but the English operator will generally choose the ordinary midwifery position on the left side, the nates being brought to the edge of the bed, so as to be within convenient reach. She should then be brought under the influence of chloroform. This has the effect of facilitating, both directly and indirectly, the passage of the hand, by overcoming rigidity and spasmodic contraction, and obviating the embarrassment which may arise from movements which are the result of apprehension or pain. The uterus is to be supported by an assistant or by the other hand of the operator. By this means valuable assistance is afforded, by movements which are made in concert so as to bring the lower extremities of the child within reach.

The directions which are often given as to the hand which should be employed are of little practical value. Indeed, it is impossible in some cases, as in placenta prævia, to recognize, before it has been passed into the uterus, the conditions which are held to indicate the right hand or the left. Most people can act much more efficiently with the right than with the left hand, and there is no possible direction within the pelvis in which the right may not be passed. The positions in which there is most difficulty are those in which it may be necessary to direct the hand towards the left sacro-iliac synchondrosis while the woman lies in the ordinary position on her left side. In this case the hand must be pronated to the fullest extent; and, if this movement of pronation is increased, as it may be by the operator turning his back towards the patient, it will pass without difficulty. The left hand would undoubtedly serve the purpose better here, if we could be sure of equally efficient action with it after the introduction. But, if the operator is left-handed, he should use the left hand in preference to the right; and, as our first object is to attain the abdominal surface of the child,—which, in the great majority of all positions, lies towards the back of the mother,—and as it must clearly be easier to pass the left hand along the sacrum than the right, the left-handed operator has a certain advantage. For the same reason, he who is ambidextrous should use that hand which may best suit the position of the child; but, if it should be impossible to ascertain the position, he should select the left, as being more likely to conduct him to the anterior surface of the child's body.

The operator should take off his coat, and bare his arm, so as to obviate, as far as is practicable, any inconvenience which may arise from pressure upon the muscles. The hand and arm are then to be liberally smeared with lard, and the points of the fingers, which are brought

resistance which he encounters. It will, however, as must be confessed, often be found that the stereotyped direction to act during an interval, and pause during a pain, cannot well be adopted, for the simple reason that the contact of the hand excites the uterus to continuous, or at best remittent action, so that if we are to wait for absolute inaction on the part of the uterus, we may abandon the effort altogether. Such continuous or spasmodic action as this may be, as we have seen, allayed by the administration of chloroform; and, if it should persist, we may still succeed, although it is necessary, in such instances, to act with redoubled caution and deliberation.

As soon as the hand has reached so high in the uterus that the inferior extremity of the child can either be felt, or may be assumed to be on the same level, the sac of the liquor amnii may be ruptured, and the fingers passed in the direction of the foot or knee. The rupture of the membranes is easily effected, by an effort of the fingers or the action of the nails in the direction of the foetus; but with this the mechanical advantage of the liquor amnii is not lost, as it is still retained by the efficient plug formed by the arm which occupies the os uteri. This renders the actual version an easy matter. The fingers of the operator lay hold of a foot or a knee, which, in withdrawing his hand, he brings with him, choosing, if he can, a moment of uterine rest for the purpose, and availing himself, if it be necessary, of the assistance of the other hand, which is to be applied externally. As this is being done, the original presentation retreats from the lower segment of the uterus, so that the turning part of the operation is complete.

Much argument has been wasted as to the propriety of bringing down one leg or two. The sound rule in practice is, that when we succeed in securing one foot, we should never pause to search for the other; as one is all that is necessary, unless, perhaps, in cases of pelvic deformity, which we shall afterwards more particularly allude to. Nay, more than this, the descent of one leg has a positive advantage as compared with two, as thus, by increasing the diameter of the pelvis of the child, the parts are more thoroughly dilated, so as to admit of the ultimate passage, rapidly, and with comparative safety, of the head of the child. And, as this is the stage at which the life of the child is most frequently compromised, it is assumed, that by abridging its duration, foetal life in the aggregate must,

FIG. 161.

Podalic version.

arrested. The tips of the fingers may even touch the knee or foot, and yet the inch or so of further advance which is required can scarcely, by any moderate effort be achieved. This is a moment at which, in our eagerness, we are very apt to pass the line which separates prudence from safety. By a vigorous thrust of the arm, we may be confident that we shall attain what we so much desire; and it is with difficulty only that we can refrain from what alone seems wanting to complete success. We must, however, with firmness and what we may term self-denial, resist this inclination, and wait a little until, perchance, we may wear out the uterine resistance which constitutes the barrier to our progress.

It is here, however, most unfortunately, that the straining of the fingers is apt, along with violent uterine contractions, to cause cramp of the muscles of the hand, a condition which may absolutely paralyze our efforts. By resting for a time, or stretching the fingers, the power of the hand may return; but it too often occurs that we find ourselves quite powerless just at the moment when we have come to count upon success crowning our efforts. Nothing will remain for us, in such a case, but the withdrawal of the hand, to our great chagrin, and either the introduction of the other, or the reintroduction of the same one after it has had time to recover. What is particularly annoying, when this is found to be necessary, is that the withdrawal of the hand from the uterus permits of the escape of what liquor amnii remains, and, consequently, of a still greater degree of uterine contraction upon the body of the child. Even in such a case, however, we may ultimately succeed by perseverance; and, when the hand has again been successfully introduced, our external manipulations may succeed in bringing the feet within reach. But, with this measure of success, our difficulties may be far from being at an end.

It sometimes happens that the hand is introduced, the foot seized and brought down to the os, and yet complete version cannot be effected. When the presence of the liquor amnii, or a relaxed condition of the uterine walls, permits of a certain degree of freedom of motion, the presenting part will recede as the foot is pulled downwards to the os. But, when the body of the child is firmly grasped by the uterus, this is not the case, and some further manœuvring, external or internal, will be required to complete the operation. The mode of acting externally through the abdominal walls has already been alluded to, and will again be more particularly described. The internal manipulation in these cases consists in pushing up the presenting part while we pull down the foot. In other words, we act upon the two poles of the long diameter of the foetus instead of one only. The vagina, however, being already fully occupied by the hand of the operator, it will be impossible for him to act upon the presenting part without letting go the hold which he has of the foot; but this is of all things what he least wishes to do, as there is often great difficulty in securing it again. By a very simple expedient he is able to effect all that he desires. A running noose of tape or worsted is to be passed over the forearm, and is then pushed upwards over the hand and beyond the os calcis and instep of the foot. When tightly drawn, this secures an admirable hold, and the hand may

into the hollow of the sacrum, whatever the original position may have been. But, when the natural rotation has not taken place, it has been found necessary to assist the movement by manual interference. The greatest caution must, in every case, be exercised, to prevent, as far as may be possible, pressure upon the cord; but, in so far as this is concerned, what has already been said in regard to presentations which are originally of the pelvic extremity, will serve for our guidance in those cases in which the pelvic end of the foetal oval is artificially, and for a particular purpose, brought down. One advantage of effecting version, so as to bring the dorsal surface to the front, will be to bring the cord naturally into the posterior part of the pelvis from the first, by which we are enabled to place it in that situation in which it is least likely to be subjected to severe pressure.

When version is complete, we have converted the case, whatever it may originally have been, into a presentation of the feet. It remains, however, for consideration, whether we are to leave the case to nature, or proceed to immediate delivery. It is almost always proper to pause, at least for a time, until we see what nature is likely to do; but, if the symptoms are such as to call for prompt action, whether in the interests of the mother or the child, we must act boldly, and without hesitation, in effecting immediate delivery. It should be remembered, that so long as the pelvis of the child remains above the brim, the cord cannot be subjected to any dangerous pressure, so that, while nothing is lost by delay at this stage, something may be gained by pausing until uterine energy is awakened. If the cord has prolapsed, or has otherwise come within reach, at this or a subsequent stage, we will be guided by the presence or absence of pulsation, and the other evidences of vitality of the foetus, in determining whether to precipitate matters or not. During the descent of the trunk, we must observe the usual precautions, but at the last stage there must be no delay, and the forceps and restoratives should be at hand, so that we may at once have recourse to them should occasion arise, and that in the manner described in the chapter on Pelvic Presentations.

The term Pelvic Version, as employed by English writers, implies an operation in which the breech, and not the feet, is brought to the os when another part originally presents. That this may, in rare instances, be effected by dexterous management, does not admit of dispute; but, at the same time, such a course of procedure is so obviously one of greater difficulty, as compared with podalic version, that we need not wonder that the former operation, which, indeed, never attracted much notice, has been all but entirely superseded by the latter. As regards the ancient operation of Cephalic Version, it seems certain that there are cases of transverse presentation in which we would be justified in making an attempt at what is a less severe operation to the mother, by pushing up the shoulder, and so manipulating as to cause it to be replaced at the os by the head. Success could here only be hoped for when the child is still movable within the uterus, and the method most likely to be attended with success is what has been designated, by Braxton Hicks and others, as the "bimanual" or "bipolar" method,—to be afterwards described.

as risk, while we may be confident that nothing but failure could attend our efforts.

But seeing that this is a question where an eighth of an inch may make all the difference between success and failure, and it is impossible to ascertain the exact space with anything more than what is at best an approach to accuracy, it follows, as a possible contingency, that we may actually turn, and subsequently find that we have miscalculated either the conjugate diameter or the size of the head, and that the latter will not pass. Such a failure as this is not so serious a matter as might at first sight appear; for if we have thus to resort ultimately to craniotomy, that operation will be attended with very little more difficulty and no greater risk than if we had begun by perforating the vertex. The mother, no doubt, has been subjected to the risks of turning in addition to those of craniotomy, but we are surely warranted in incurring this additional risk in the hope, if successful, of saving the child.

Let us now examine shortly the positive advantages which are claimed by Simpson for the operation of turning in contracted pelvis. The biparietal measurement of the head is, as he points out, greater than the bimestoid; and as, in turning, the latter enters the contracted space first, he argues that, on obvious mechanical principles, the compressibility of the head is increased by version; and, as it is well known that in some cases of this kind, when the child has been born alive, the parietal bones have been found to be flattened, indented, or even fractured, he concludes that turning, under such circumstances, is not only a reasonable proposal but an actual gain in facility of delivery and safety to the child. He goes, however, too far, and attempts to prove too much, when he maintains, as a corollary to this proposition, that the effect of uterine contraction, when it forces a presenting head against a contracted brim, is to bulge outwards the biparietal poles, and thus increase the mechanical difficulty with the progress of labor. Simpson's theory has been contested by McClintock, E. Martin, and others, upon the whole, we think, unsuccessfully; while, in corroboration of his views, a considerable weight of practical evidence has accumulated, of which the following from Barnes's lectures is a striking illustration: "In the first place let me state a fact which I have often seen. A woman with a slight contracted pelvis, in labor with a normal child presenting by the head, is delivered, after a tedious delay, spontaneously or with the help of forceps; the head has undergone an extreme amount of moulding, so as to be even seriously distorted. The same woman in labor, again, is delivered breech first; the head exhibits the model globular shape, having slipped through the brim without appreciable obstruction. In the second place, I have, on several occasions, been called to an obstructed labor in which the head was resting on a brim contracted in the conjugate diameter. Of course nature had failed; the *vis a tergo* was insufficient. I have tried the long double-curved forceps, trying what a moderate compressive power, aided by considerable and sustained traction, would do to bring the head through, and have failed. I have then turned, and the head coming

sion has already been made, as these may at any time call for special adaptations, to which thorough operative capacity and an intimate knowledge of the subject can alone guide us. Another possible difficulty we have known to occur in connection with twin pregnancy, in which the operator, after introducing his hand, has seized the foot of the wrong child.

The operation to which alone we have hitherto alluded, is the ordinary operation of turning, necessarily involving the introduction of the whole hand within the cavity of the womb. There is, however, another operation, or rather a modification of this operation, which may be practiced with less risk to the mother, and even, as it would seem, under circumstances which would render the ordinary procedure difficult, if not impossible. This is *Bimanual* or *Bipolar Version*, an operation which is attracting, year by year, more and more of the attention which it merits. Early in the present century, Wigand suggested a method whereby the position of the child within the womb could be altered without risk to the mother, by external manipulation alone. His observation applied to transverse presentations only, and his plan was,—having ascertained, by vaginal examination, the exact position of the foetus,—so to press upon the child externally as to bring to the os uteri that pole of its long diameter which was lowest in the pelvis. In a word, he claimed to be able to practice both cephalic and podalic version, without even introducing a finger into the vagina, although he seems to have employed the inner hand to guide or receive the head or breech into the os. The directions which he gives include elaborate, but, we fear, impracticable instructions as to the manner in which we should proceed—with the view of availing ourselves, to the utmost, of gravitation—to place the patient, now on one side, and again on the other, at various successive stages of the operation. It is quite certain that Wigand never contemplated anything more than partial version, so that his novel manœuvre, which found considerable favor in Germany, was never supposed to be applicable to cases of placenta prævia, or to any other case in which the head was originally the presenting part.

Dr. Robert Lee seems to have been the first to suggest a method of turning, which is the opposite of that to which Wigand lent the weight of his authority. In cases of incomplete dilatation of the os uteri, he brought two fingers, which he passed into the uterus, to bear upon the head, which he first of all attempted to displace, and, when he had succeeded in this, he successively pushed aside those parts which came opposite the os in the same direction as that in which the head had disappeared, until, ultimately, the feet were made to present, or were brought within reach of the finger, and so secured. We owe, however, to Dr. Braxton Hicks the method of combined external and internal version, which bids fair, in a great measure, to supersede the old method, and for the expediency of which we can unhesitatingly, and from personal experience, vouch. The conditions which have already been mentioned as favorable to ordinary podalic version, are even more essential to the successful performance of the bipolar method. Unless, therefore, the child is movable with tolerable freedom within

The hand which is retaining gently the head from the outside should continue there for some little time, till the pains have insured the retention of the child in its new position by the adaptation of the uterine walls to its form."¹

We shall make no apology to the reader for the length of this extract and the prominence which we have thus given to the operation of bipolar version, as we look upon it as one of the most important improvements in modern obstetrics, which is attracting an amount of attention ever on the increase, and which is, if we mistake not, likely ere long to supersede, in a great measure, the more familiar procedure of ordinary podalic version.

CHAPTER XXXII.

EMBRYOTOMY.

CONDITIONS WHICH WARRANT THE OPERATION—CRANIOTOMY: CONSISTS OF VARIOUS STAGES—PERFORATION: VARIETIES OF PERFORATORS: METHOD OF, AND PRECAUTIONS TO BE OBSERVED IN PERFORATING—CRANIAL CONTENTS TO BE BROKEN UP AND DISLODGED—TRACTION TO BE NOW EMPLOYED—USE OF THE CROTCHET: WHERE TO FIX IT: DANGERS OF—THE GUARDED CROTCHET—THE CRANIOTOMY FORCEPS—REMOVAL OF THE VAULT OF THE CRANIUM—PROTECTION OF THE MATERNAL TISSUES—DAVIS'S OSTEOTOMIST—THE SCALP TO BE PRESERVED—TURNING AFTER CRANIOTOMY—CANTING THE BASE, AFTER REMOVAL OF THE FLAT BONES, AND BRINGING THE FACE DOWNWARDS—THE CEPHALOTRIBE: FRENCH AND ENGLISH MODELS—CEPHALOTRIPSY THE FINAL STAGE IN THE OPERATION OF CRANIOTOMY—DETAILS OF THE OPERATION—MAY THE CEPHALOTRIBE BE USED AS A TRACTOR? SUBSEQUENT EXTRACTION OF THE TRUNK—CRANIOTOMY IN BREECH DELIVERY, AFTER THE PASSAGE OF THE TRUNK—EMBRYULCIA: EVISCERATION OF THE FŒTUS: APPLICABLE CHIEFLY TO IMPACTED TRANSVERSE PRESENTATION—VAN HUEVEL'S FORCEPS SAW—DR. BARNES'S PROCESS OF CRANIAL SECTION BY THE ECRASEUR.

EMBRYOTOMY is, in one sense, the most objectionable of all the operations of Midwifery; for, of all other possible modes of procedure, this is the one which most certainly involves destruction of the child. On this account, the accoucheur shrinks, with natural repugnance, from an operation which necessarily involves mutilation of a dead, and must destroy a living child. Such, however, is a view which we are apt to carry to an extreme, and overlook, in so doing, the more important

¹ On Combined External and Internal Version: by J. Braxton Hicks, M.D., F.R.S., &c., London. 1864.

clearly that this must not be allowed to take too prominent a position, as it not unfrequently happens that women who have had an ordinary labor before, under circumstances which are apparently similar, are, if not relieved, subjected in subsequent labor to the greatest peril. This may be due, according to Barnes, to progressive pelvic contraction, or, as D'Outrepoint holds, to progressive increase in the size of the children. But, on the other hand, we may fall into the opposite error, if Dr. Matthews Duncan's deductions are correct,—that after women have attained the age of twenty-nine, the weight of their children falls,—by supposing, that because craniotomy was found necessary on a former occasion, it must necessarily be required in subsequent pregnancies, which have been allowed to go to the full time. Among the rarer conditions demanding craniotomy, are impacted mento-posterior positions of the face, cases of locked twins in which one head can only be released by perforating and reducing the bulk of the other, double-headed monsters, and hydrocephalus.

There are, however, in addition to these, certain conditions of the mother which may call for the operation. It has already been shown that, in cases in which, from any cause, speedy delivery is required, turning is to be preferred to the forceps, when the dilatation of the os is not sufficient to admit of the safe use of that instrument; and to this it may now be added, that an even less degree of dilatation of the os will suffice for craniotomy than for turning, as all that is essential is space for the introduction of two fingers and the extremity of the perforator. In cases, therefore, of convulsions, great exhaustion, and some instances of rupture of the uterus as already particularized, in which the state of the os forbids both the forceps and turning, it may be necessary for us to perforate. As a rule, however, and excepting the cases of rupture of the uterus alluded to, we should never operate by craniotomy while there is a possibility of nature prevailing, until we have given her a fair chance, and have waited to see what may be effected by the ordinary process of moulding.

The condition of the parts, or the stage of labor at which the operation should be performed is a matter of great importance, less perhaps in regard to the mere facility with which it may be effected than with reference to the safety of the woman. Although, as has been observed, a very moderate dilatation of the os is all that is essential, it affords great comparative facility to the operator, and proportionate safety to the mother, if the head is divested to a great extent of the covering which, in the early stage of labor, it derives from the lower segment of the uterus. It is of even greater importance that the head should have descended, to some extent, into the pelvis, and be within easy reach, for the operation upon a head which is still above the brim will be found, even under circumstances which are in other respects favorable, to be a very different operation from that in which it is arrested within the cavity of the pelvis. There are conditions, however, which may render a case manifestly impracticable, or which may admit of doubt; so that the peculiarities of individual cases must be our guide as to whether anything is to be gained by delay, and, if so, to what extent we are to

the surface of the cranium, through which it is thrust by a combined pushing and boring movement as far as the stops. While this is being effected, particular attention should be given, so that the force be applied at right angles to the surface against which it impinges, otherwise the point is apt to glance off, and may seriously wound the mother.

Some have advised that perforation should be effected at the sutures or fontanelles; but, although this renders the operation somewhat easier, the disadvantage is that the subsequent collapse of the head, by overlapping of the flat bones of which its vault is composed, will necessarily obliterate the aperture, and impede the escape of the cerebral tissue. It is, therefore, much better that we should perforate the parietal bone which presents; and, when this has been done in the manner described, the handles are pressed together and the blades separated. This, by tearing asunder the parts, makes a lacerated and irregular gap in the cranial walls; but, in order to render the aperture more patent, and thus facilitate the escape of the contents, the handles are turned so as to bring the blades half round, and another similar incision is made at right angles to the first. The perforator is then to be thrust into the cavity of the cranium, and freely moved about in all directions so as to break up, as far as is possible, cerebrum, cerebellum, and membranes; and if the child is alive, it will be proper to pass it in the direction of the medulla oblongata, so as to cause its death, as cases have occurred in which, after perforation and escape of the greater portion of the cerebrum, the child has been born alive. The perforator is then to be removed with the same precaution as was observed on its introduction. If the breaking up of the brain has not been satisfactorily accomplished, this may be completed by the crotchet, which, indeed, some operators prefer altogether for this purpose, withdrawing the perforator so soon as the breach in the cranial walls has been completed.

Complete disorganization of the textures within the cranium does not necessarily imply their immediate expulsion, which can alone insure compression of the cranial vault. This, no doubt, has already been in a great measure effected by the nature of the aperture which we have made in the parietal bone; but, unless uterine action is present, and can act efficiently upon the cranium, the amount discharged, even through a considerable gap, may be but trifling. In order, therefore, to encourage compression, and the consequent diminution of the cranial diameters, it has been suggested that we should extract the brain-substance; and this may be effected without danger, and with more or less of success,—which will be proportionate to the thoroughness with which the cerebral disintegration has been effected,—by a scoop or spoon, or by the injection within the cranium of a powerful stream of water. So soon as a large portion of the cerebral contents has been permitted to escape, the bones of the skull will collapse under the influence of very trifling compression. This, however, may completely fail, whence arises the necessity of proceeding to another stage of the operation.

If nature, after complete decerebration, fails to effect some advance of the head, it will then be proper to attempt delivery by traction exercised

the operation, the blades of the craniotomy forceps are to be applied, one within and the other without the cranium, that which is convex on the outside being for application over the scalp. It will be observed that one blade is fitted with sharp teeth corresponding to pits or depressions upon the opposed surface of the other. When suitably adjusted, therefore, all that the operator has to do is to press the handles together with some force, which will insure a grasp upon the wall of the cranium, over a more extended area, as well as more firmly, than can, under any circumstances, be effected by the crotchet. The handles being firmly bound together, traction must now be practiced in the direction which may be proper to the actual position of the head. If the bone gives way, the detached portions must be cautiously removed, and a fresh hold obtained wherever the parts may seem most likely to bear the strain; but, when the resistance is great, it will soon become evident that this method of extraction will fail, and we must therefore pass to a more advanced stage still of the operation of craniotomy.

The process which, under such circumstances, is rendered necessary, is the deliberate removal in detail of the flat bones, which require for this purpose to be broken up into pieces of convenient size, in order that the whole vault of the cranium may be thus removed, including, in extreme cases, the occiput and the forehead. No part of the operation requires more caution than the removal of the fractured portions of the bones, which are often jagged and splintered, and always sharp at the edges, so much so, sometimes, as to cut through the cuticle of the fingers of the operator, which may afterwards be observed to be scarred as if by the edge of a sharp knife. When a fragment of bone becomes detached, in an attempt at extraction either by the crotchet or craniotomy forceps, it is always better to remove it at once, and for this purpose the finger will generally suffice. When our object is to remove the whole cranial vault, the bones are, in the first place, to be broken and separated from their attachments within the scalp—a part of the operation which is best effected by means of the craniotomy forceps. In this case, however, we introduce the blades somewhat differently, passing the outer blade between the scalp and the bone, so that the latter is directly grasped. A smart wrench by the wrist is generally all that is necessary to fracture the bone, when the severed portion which remains between the blades may be removed by the aid of the instrument. Much will, however, depend upon the shape of the fragment, which is to be carefully ascertained by the finger acting in concert with the forceps. If it is very irregular in shape, it will, of course be all the more difficult to protect the soft parts of the mother from so many cutting surfaces, and it may be necessary to divide it again before attempting extraction. The mode of grasping the fragment must also be attended to, so as to bring elongated portions lengthwise, and in many similar ways we may reduce risk by careful manipulation. Dr. Davis was so impressed with the danger which attends the removal of the fractured cranial bones that he devised an instrument, or rather a series of instruments, which he termed Osteotomists, by which the bones could be more safely removed. One of them is here shown. It is of the nature of a powerful punch, by which successive minute por-

down, this should always be done ; but the difficulty in extreme contraction is that the vault of the cranium is not yet sufficiently compressible. It is mainly, therefore, with the object of ultimately bringing down the forehead, which usually lies to the right side, that we thus pick away the bones until there remains, when it is complete, nothing but the scalp.

There is one method of procedure which is not often resorted to, but which, in some instances, is of undoubted efficiency after perforation. This is the ordinary operation of Turning, which may sometimes be effected without much difficulty, when, by the perforator, we have reduced the bulk of the child's head. To attempt this in cases of very great distortion would, on many grounds, be improper ; but in more moderate disproportion, it is sometimes an efficient and valuable method of completing delivery. A striking instance of this kind, which we saw with Drs. Lyon and Dick, was that of a woman in whom it had been found necessary to perforate in consequence of very considerable conjugate contraction. Traction with the craniotomy forceps was found to be insufficient, and failed to dislodge the head of the child. A considerable portion of the bones was then removed, but before entirely removing them, and proceeding to the more advanced stages of the operation, to be described immediately, an attempt was made to turn, when, the foot being brought within reach, this was effected without the slightest difficulty. In all such cases it is of the first importance that the scalp should cover the fractured bones, and we should, therefore, be particularly careful that this should be insured before we attempt to turn.

The flat bones being removed, the next question for consideration which presents itself is one which, without a thorough knowledge of the foetal and maternal parts, could not fail to give rise to much doubt and apprehension. What remains behind of the head consists entirely of the base of the cranium, a part which, even at this early age, is very solid and unyielding, in order to afford protection to the vital structures which might otherwise be subjected to dangerous or fatal pressure. The shape of the base of the skull is that of an irregular ovoid disk, the long diameters of which are across the pelvis. It would seem, therefore, at first, as if no great advantage had been gained by the removal of the flat bones, but a moment's consideration will show that a very simple manœuvre, and one which is generally easy of performance, will suffice to place what remains of the head much more favorably. "I have carefully," says Dr. Burns, "measured these parts, placed in different ways, and entirely agree with Dr. Hull, a practitioner of great judgment and ability, that the smallest diameter offered is that which extends from the root of the nose to the chin. For, in my experiments, after the frontal bones were completely removed, and the lower jaw pressed back, or its symphysis divided, so as to let its sides be pushed away, this did not, in general, exceed an inch and a half. It is, therefore, of great advantage to convert the case into a face presentation." The practice thus recommended by Burns was at an earlier date upheld by Dr. Osborn, who was the first clearly to show that, by *canting* the base of the skull, so as to bring it

breaking the basis of the cranium, and determined to try the second by endeavoring to change the position. I, therefore, again introduced the crotchet in the same manner, and fixing it in the great foramen, got possession of my former purchase; then, introducing two fingers of the left hand, I endeavored with them to raise one side of the forepart of the head, and turn it a little edgeways. Immediately and easily succeeding in this attempt, the two great objects were at once accomplished; for the position was changed and the volume diminished. Continuing my exertions with the crotchet, I soon perceived the head advance, and, examining again, found a considerable portion of it had been brought into the pelvis. Every difficulty was now removed, and, by a perseverance in the same means for a short time, the remaining part of the head was brought down and out of the os externum."

We cannot wonder that the result in this case, and the satisfactory recovery of the mother, should have been looked upon as a great triumph of the crotchet as compared with the otherwise inevitable expedient of the Cæsarian Section. Of late years this question has been more thoroughly investigated and illustrated. Dr. Braxton Hicks, in a learned and elaborate paper,¹ describes very fully the mechanism of the proceeding. What he recommends is to grapple the orbit and draw it downwards by means of a small blunt hook. "The one which I use," he says, "is of the following size: the diameter of the iron rod from which it is made is about a quarter of an inch, of the length of the ordinary blunt hook; with handle also alike. The hook is a half circle about one inch in diameter, and is made hard, to prevent its opening during traction; the shaft is made of soft iron, and can be bent by the hand into any form, being thus adaptable to any situation. I may mention here that this hook is useful, in other cases, in a variety of ways, where it is impossible to employ the unwieldy blunt hook in general use."

Dr. Barnes, after removing the arch of the calvarium, or the whole of the bones if the distortion be extreme, prefers, for effecting the same object, the craniotomy forceps. The instrument which he uses is of considerable strength, and is provided with a screw at the ends of the handles, which secures for it the ordinary advantages of the cephalotribe, by crushing in the frontal bones, and has the further advantage of securing an unyielding hold. "Then traction is made, carefully backwards at first, in the course of the circle round the false promontory. As the face descends it tends to turn chin forwards, and this turn may be promoted by turning the handles of the instrument. It is not necessary that the turn should take place, for the case differs entirely from that of the normal head. There is no occiput to roll back upon the spine between the shoulders. The head comes through flatwise like a disk by its edge."

The above extracts, which represent the most modern and scientific modes of practice, will suffice to show that where the pelvis measures *two inches*, or even a little less, in the conjugate diameter, a fully developed child may yet possibly be extracted. It is obvious, however,—the transverse diameter of the face being more considerable,—that, to insure success, there must be a larger space, certainly not less than three inches, in the transverse diameter. "I go further," says Barnes, in reference to this operation, "and declare that it is perfectly unjustifiable

¹ Obstetrical Transactions, vol. vi, 1865, p. 268.

to neglect this proceeding, and to cast the woman's life upon the slender chance afforded by the Cæsarian Section."

The Cephalotribe.—If the facts and arguments above cited are strictly correct, the number of cases in which the cephalotribe is called for are probably very limited in number. They are certainly much more so

FIG. 171.

than was at one time supposed. The earliest instrument designed for crushing the bones of the foetal skull seems to have been the Compressor Forceps of Assolini, which was used by him to crush the base of the skull and the face, early in the present century. The blades of this instrument were not made to cross, so that when they were screwed together, the fulcrum of each lever was the joint at the end of the handles, where they were articulated. The only modern instrument resembling this in principle is the cephalotribe of Lazarewitch of Charkoff. What, with certain modifications, is known as the French cephalotribe, was invented by the younger Baudelocque. It is, in appearance, a most formidable instrument; the one in our possession weighing no less than 4 lbs. 6½ oz., and measuring across the blades nearly 2 inches, in the widest part. It requires, therefore, no argument to show that such an apparatus is not applicable to a case such as that of Elizabeth Sherwood. Various modifications have, in modern times, been designed by Scanzoni, Braun, Simpson, and others, almost all of which are constructed with a moderate degree of pelvic curve. They are all made

Simpson's cephalotribe.

lighter than the original instrument, as it has been found that clumsiness may be, to some extent, avoided without any material sacrifice of strength. The tendency of the English instruments is to approach more in form to the ordinary midwifery forceps, as is well shown in Simpson's cephalotribe, which is here represented.

As in the case of the forceps, there has existed in this country some controversy as to whether the pelvic curve should or should not be adapted to the cephalotribe, those who approve of the straight instrument arguing with some force that the straight blades are easier of application, and can alone be properly applied when we wish to rotate. The fact that the head is at the brim seems to us, on the contrary, to vindicate, on the same grounds which have been urged with reference to the long forceps, that unless we are, as Pajot and some others advise, absolutely to discard the instrument as an extractor, we must admit that the principle of the pelvic curve must be conceded here also. The objections which Dr. Kidd and others have urged against the pelvic curve have, however, so far prevailed that the English instruments are all, without exception, made with a slighter curve than the French ones.

The French cephalotribes still retain, as we have said (and, we may add also, the German modifications of Braun and Scanzoni), much of the original formidable dimensions of the instrument. We might have

ated ourselves with the mere mention of this fact were it not that
e years some able obstetricians have condemned the English instru-
and insisted that we should do better to adhere more closely to
h models in the construction of cephalotribes. Dr. Matthews

FIG. 172.



French cephalotribe.

FIG. 173.



Dr. Matthews Duncan's cephalotribe.

an, assisted by Professor Inglis of Aberdeen, and some others,
some very interesting experiments with a view of comparing the
of Simpson's cephalotribe and the more modern of the French
instruments. The experiments were performed on foetal crania, and on
kulls of dogs, and certainly served very clearly to demonstrate
he French cephalotribes have greater power. Are we, therefore,
at account, to prefer them, to the exclusion of those with shorter
es?

reply to this question, Dr. Duncan expresses a decided preference
e French cephalotribe, a modification of which he has devised, so
combine the lesser degree of pelvic curve which is characteristic
English instruments, with certain other modifications which he con-
as offering some advantage. Dr. Duncan's cephalotribe is here

the contracted diameter of the pelvis. This condemnation of the cephalotribe as a tractor, seems chiefly to be supported by those who, in France or elsewhere, uphold the use of the bulky instruments which are very obviously less suitable for such a purpose. What seems, therefore, to be the chief advantage of the lighter English instrument, is that traction may by it be more safely performed. Indeed, it appears to us in the highest degree irrational that we should forego all the advantages of traction which spring from such a firm grasp of the head as the cephalotribe gives. Caution, indeed, we can scarcely exaggerate; but, we can see no reason why, after efficient crushing, we should not pull gently with the handles backwards, which we can, of course, do with more safety, and at greater advantage than if there was no pelvic curve to the blades. Another disadvantage of removing the blades, and leaving the further progress of the case to nature is said by Dr. Barnes to consist in the resiliency of the foetal structures; so that a head so flattened within the grasp of the cephalotribe as to measure not more than an inch and a half, may spring out on the removal of the blades to more than two inches.

When the mutilated head at length glides through the chink which has so obstinately barred its progress, the young operator may hastily conclude that his operative difficulties are necessarily at an end. In cases of minor disproportion, it will no doubt be so; but, in extreme distortion, the descent of the shoulder and trunk may be attended with very considerable difficulty. If the remains of the head be still within the grasp of the cephalotribe, it is proper to continue the tractile force backwards, as far as may be practicable with a due regard to the integrity of the perineal structures. This is done with the view of disengaging the anterior shoulder, or bringing it a little in advance, so that the blunt hook may be fixed in the axilla to pull it through. It may be necessary at this stage, when the blunt hook and crotchet fail to effect delivery, that the cephalotribe should be again used, and the trunk crushed prior to delivery; a proceeding which, although rarely necessary, is certainly preferable to the employment of such violence as might otherwise endanger the tissues of the mother.

There are cases in which it is found necessary to lessen the bulk of the head in breech presentations, or after turning, the head being arrested after the trunk has been successfully disengaged from a contracted pelvis. In this case the conditions of the operation are inverted, but are not by any means, as a rule, more difficult. Perforation may be effected behind the ear, and this situation should be selected as the point at which we may most readily attain the cavity of the cranium, and give exit to the brain-substance, so as to permit of the collapse of the head. In this case, also, the cephalotribe may be employed with great advantage by crushing the base of the skull, which, in this instance, is in advance of the vault; and if the measurements are such as to have already admitted of turning, or of the descent of the breech, we may be almost sure that the collapse of the head, which must now necessarily ensue, will amply suffice to permit of its passage through the pelvis.

Embryulcia.—When some part of the child other than the head

saw is introduced after the blades have been adjusted, and is then made to cut from without inwards, or from the lock towards the tips of the blades, until the head has been divided—the chain being worked by two small cross handles at its extremities, while its action, protected by the blades of the forceps, may be looked upon as absolutely safe.

Dr. Barnes has lately suggested another operation, by which the wire *écraseur* may be used for the purpose of bisecting the head, or otherwise operating upon the body of the foetus. This method of performing Embryotomy was demonstrated by the inventor before the Obstetrical Society, the instrument employed being the *écraseur* of Braxton Hicks. He recommends the employment, not of the wire rope suggested by Hicks,¹ but of a single loop of strong steel wire, which he manipulates, so as to pass it through the cervix uteri and the chink of the pelvic brim. The crotchet being passed into the hole made by the perforator, and held by an assistant, so as to steady the head, the loop is guided over the crotchet to the right side of the uterus, where the face lies. “The compression being removed, the loop springs open to form its original ring, which is guided over the anterior part of the head. The screw is then tightened. Instantly the wire is buried in the scalp; and here is manifested a singular advantage of this operation. The whole force of the necessary manœuvres is expended on the foetus. In the ordinary modes of performing embryotomy, as by the crotchet especially, and in a lesser degree by the craniotomy forceps and cephalotribe, the mother's soft parts are subjected to pressure and contusion. The child's head, imperfectly reduced in bulk, is forcibly dragged down upon the narrow pelvis, the intervening soft parts being liable to be bruised, crushed, and even perforated. All this danger, obviously increasing in proportion to the extent of the pelvic contraction, together with the bulk of the instruments used, deprives the mother, in all cases of extreme contraction, of the benefit of embryotomy, leaving her only the terrible prospect of the Cæsarian section. When the anterior or posterior segment of the head is seized in the wire-loop, a steady working of the screw cuts through the head in a few minutes. The loose segment is then removed by the craniotomy forceps. In minor degrees of contraction, the removal of one segment is enough to enable the rest of the head to be extracted by the craniotomy forceps. But in the class of extreme cases, in which this operation is especially useful, it is desirable still further to reduce the head by taking off another section. This is best done by reapplying the loop over the occipital end of the head.”

A word may here be added as to the probable range of cases within which the cephalotribe may be applied. Much will, of course, depend,

¹ We have frequently employed this instrument for the removal of uterine polypi, and in other similar operations, but have found that the wire ropes suggested by the inventor are not to be depended upon, and are apt to snap under a powerful strain. Thinking at first that this was due either to some imperfection of the instrument, or to some fault in the annealing of the wire of which the rope was composed, we consulted Dr. Hicks, who was so obliging as to order a complete instrument and ropes, after his own model; but the result was still far from satisfactory. From the experience we have since had of the single steel wire suggested by Dr. Barnes, we are inclined to give to it a decided preference.

proceeding is not, properly speaking, the Cæsarian Section, these cases are only to be regarded as instances of Laparotomy or Gastrotomy. It is not precisely known at what epoch Hysterotomy was first performed on the living woman; for there is every reason to believe that the cases published by Rousset in 1581 were to be referred chiefly to the preceding category. This work, celebrated in the history of the subject, gave rise to the most extravagant expectations, and at one time the operation was so recklessly performed by surgeons, that it was only by the uncompromising attitude of Guillemeau and Ambroise Paré that it fell into disfavor. It is of this period that Scipio Mercurius spoke when he talked, with pardonable exaggeration, of the operation being as common in France as bleeding in Italy. The opposition thus encountered in such influential quarters had wellnigh condemned the Cæsarian operation to oblivion; but it was again revived, and gave rise to endless and bitter discussion during the whole of the seventeenth, and, we may add, the first half of the last century, without anything definite having been elicited or determined upon, the profession being divided into two parties, one of which condemned the operation in the most uncompromising way, while the other as warmly, and with even less of discretion, was enthusiastic in its support. It will be observed, therefore, that the Cæsarian Section, as now calmly looked upon in the light of science, dates from quite modern times.

While it must be admitted that every step in advance which has been established by conservative midwifery throws further into the shade the sacrificial or more desperate operative resources of the art, there probably exist no practitioners in the present day who will not admit that there are cases in which hysterotomy is justifiable on grounds which will stand the test of the strictest scientific examination. Putting aside, for the moment, the cases in which it may be practiced upon the dead, it may be broadly asserted that the operation is called for on the living in all cases in which the state of parts is such as to preclude the possibility of delivery by embryotomy. In other words, we are driven to this last resource wherever we recognize the fact, that the fœtus, however mutilated, cannot be extracted by the pelvic canal.

Considerable difference of opinion unfortunately exists as to the limit of contraction which will warrant the performance of Hysterotomy. In Germany, it is very generally asserted that two and a half inches, in the conjugate of the brim, is to be held as the limit in question; but there are, in so far as we are aware, none in this country who indorse this view. What has already been said in the preceding chapter affords ample proof that craniotomy may be successfully performed in contractions of one inch and three-quarters; and the experience of some of the most distinguished of modern operators seems to show that this limit may be reduced to one inch and a half. We may say, then, confidently, that when the conjugate diameter exceeds these limits, we are in no case justified in at once deciding in favor of the Cæsarian operation. We must once more, however, reiterate a former observation, and call attention to the fact that the conjugate measurement is not alone to be taken into account—as it is too much the fashion to do—seeing that we may have irregular or angular distortion, in which

allowed herself to become pregnant, we should not act rather in the interests of the child; or, in other words, if we weigh the life of the child as of equal importance in any case with that of the mother, we will speedily become bewildered in the mazes of casuistry, and may be led to do what is morally wrong. In a word, hysterotomy is no exception to the general rule, that we should act *primarily* in the interests of the mother.

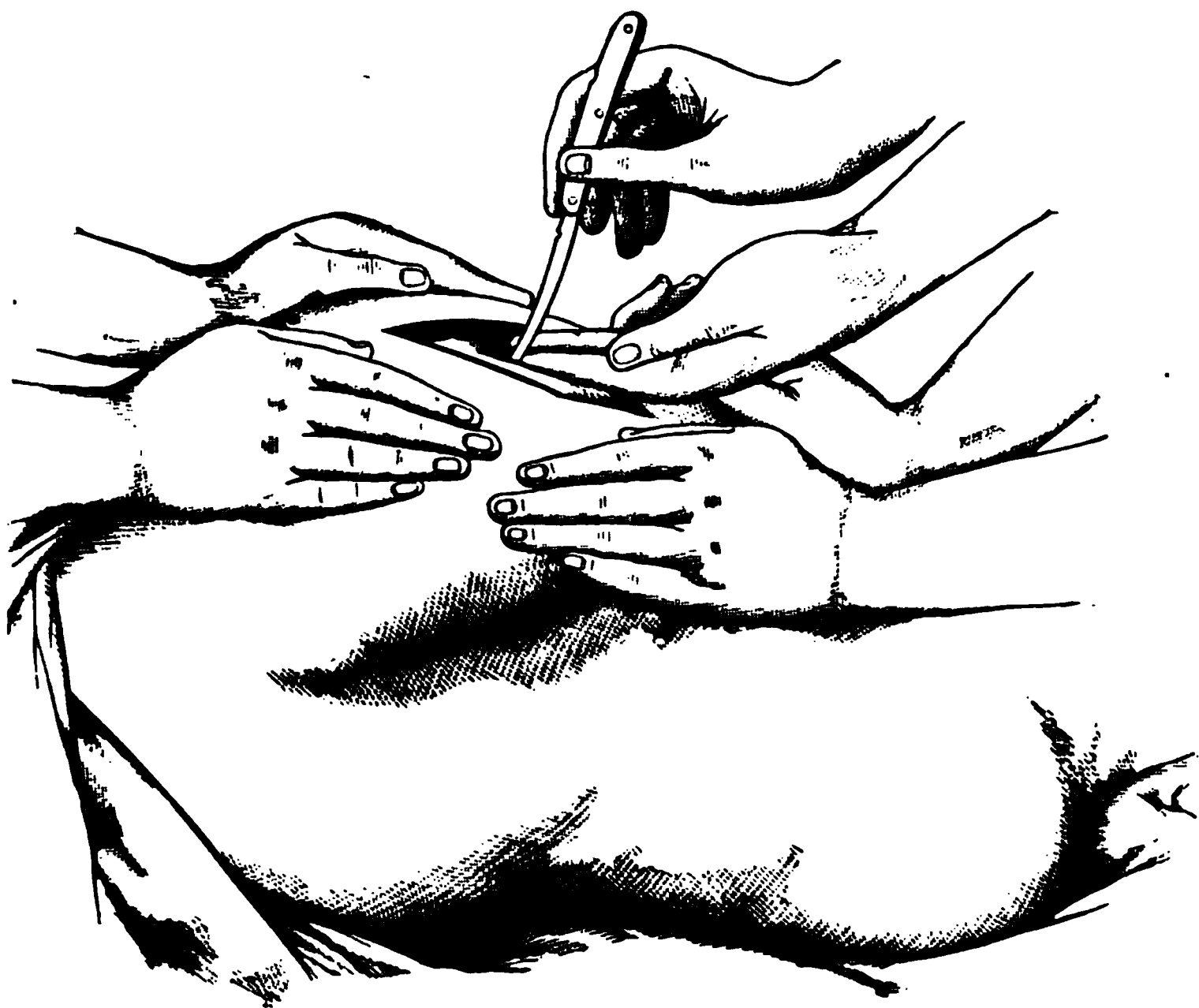
When the operation is called for by the death of the mother, either before or during labor, there are no considerations which will encourage a moment's hesitation or delay. If during labor, it may be possible to turn and deliver, or to extract by the forceps almost as rapidly as to remove the child through the abdominal walls,—and this proceeding has the advantage of being less repugnant to the feelings of relatives and friends; but, if the os is not sufficiently dilated, or if labor has not commenced, we have no choice in the matter, the only rule being to extract the child without unnecessary delay. The period during which the vitality of the child may be preserved is probably very limited. Authentic cases are recorded in which the child has been removed alive ten, fifteen, and even thirty minutes after the death of the mother; but we must treat as fables those instances of which we read, where it is said to have been found alive, ten, fifteen, or twenty-four hours after the mother had ceased to live. In death before the seventh month, it would be a manifest impropriety to operate; but religious convictions have caused this to be done in order that the child may have the benefit of Christian baptism.

The Cæsarian operation is, however, under certain circumstances, imperatively demanded while the mother still lives. Let us see, therefore what are the conditions upon which success will mainly depend. The first, and perhaps the most important point, is the early recognition of the nature and extent of the obstruction. This will enable us to prepare the woman, in some degree, for the great peril to which she is about to be subjected, by careful attention to the bowels, and so forth. It is a matter of doubt, whether we should wait for the coming on of labor, or induce it artificially. There are arguments in favor of both modes of procedure, but perhaps the safest plan will be to wait until nature gives evidence that she is about to call upon the uterus to assume its physiological action, which will be an assistance to the operator at certain stages; and, besides, we are entitled to assume that, at the full time, the healing process is more likely to be encouraged by the normal physiological phenomena of involution. Under no circumstances should we operate until the os has opened to some extent, so as to permit of the discharges passing by the normal channel; but, if it be thought advisable to precipitate matters, this can always be done by some of the ordinary modes of procedure for bringing on premature labor. Winckel says that the most favorable period for the operation is the end of the first stage, and he recommends that we should not rupture the membranes, as some have done, with the view of permitting the escape of the liquor amnii.

The Operation.—The measures to be taken before commencing the operation should be those which the most experienced of our ovari-

The surface of the uterus being now brought into view, the next stage of the operation consists in the section of its walls. It has been said that the site of the placenta may be determined by auscultation, palpating of that portion of the uterine wall, and by certain other signs, which it is unnecessary to refer; but we do not believe that any of these signs are such as may be depended upon, so that the exact situation of the placenta must remain, in some degree at least, doubtful. The uterine incision is to be made in the middle line, so as to correspond to that in the abdominal walls, and is to be carried cautiously through the peritoneum and proper tissue of the organ, so as to avoid

FIG. 174.



Hysterotomy.

fundus and cervix; the reason being that the section of the circular vessels there situated would be extremely likely to cause a gaping of the wound. As the knife approaches the inner surface of the uterus, we must exercise some caution lest we injure the placenta, which may be immediately subjacent; and if it should chance that this structure intervenes between us and the embryo, we must carefully make our way along the edge of the placenta before attempting to extract the child.

If—as is usually considered a favorable condition at this stage—the membranes are intact, the escape of the liquor amnii must be guarded against at the moment of perforation. For this purpose, the aperture in the membranes should be made as minute as possible, and an assistant specially detailed for this duty should carefully receive in sponges the fluid as it escapes, so as to prevent its entrance into the cavity of the

and it is doubtful, as may be inferred from the experience of Winckel, whether or not it is in any way beneficial. Still, on ordinary surgical principles, and recognizing the fact that, in a certain number of fatal cases, the wound has been found gaping after death, we cannot wonder that most operators seek in this way to promote union of the uterine tissues. But for one circumstance, the most advantageous procedure would be to bring the uterine and abdominal wounds into close apposition by the same suture; but the circumstance in question is a most important one, and depends upon the contractility and natural involution of the uterine tissue, which would necessarily involve forcible dragging upon the wound. To effect closure of the uterine incision by means of suture, while the risk referred to is at the same time avoided, has been, therefore, the great object of many of those who have had occasion to perform the operation. Mr. Spencer Wells, for example, in a case in which he performed it with a successful result, passed an uninterrupted silk suture, the end of which he brought through the vagina, and subsequently removed; while Dr. Barnes suggests an ingenious but more complicated method, by which the uterus is stitched and united to the margin of the abdominal wound, while provision is, at the same time, made for the contraction above referred to.

Whether or not the uterine wound is closed, that in the abdominal walls is, of course, to be brought into accurate apposition. The material to which a preference is usually given is fine silver wire, of which five or six stitches are to be passed through the cutaneous and peritoneal margins of the incision; and after these have been carefully adjusted, they are to be drawn tight and fastened in the usual way, additional superficial sutures being, if necessary, added, so as to bring the whole length of the superficial incision into accurate apposition. The carbolyzed catgut ligature suggested by Professor Lister may, with possible advantage, be substituted for the silver wire. Prepared gauze, or other antiseptic dressings, may now be applied, which are to be retained in their position by strips of sticking-plaster and a carefully adjusted bandage.

A full opiate should now be administered either by enema or suppository, and perfect quiet and rest enjoined, the dressings being undisturbed for five or six days. The sutures are to be removed about the eighth day. The vagina may be washed out by injection of tepid water with a little Condyl's fluid, and the bladder emptied by means of the catheter twice a day; and, on the fourth or fifth day, the bowels may be relieved by a simple enema. The diet throughout should be of the lightest possible character, and every conceivable disturbing element, bodily or mental, should be scrupulously avoided.

Reference has already been made to the operation of ovariectomy. It must not, however, be supposed that we have any idea of tracing the analogy which exists between the two operations. Hysterectomy, indeed, involves conditions which are manifestly far less favorable than those which attend on an ordinary case of ovariectomy, and we need not wonder that the results are less successful. We cannot, however, avoid the reflection, that not many years ago the latter operation was looked upon as scarcely more promising in its results than that which

It sometimes happens, as, a result of the healing process, that the uterine and abdominal wounds become agglutinated, so as to produce permanent adhesion at this place, without, as would appear, entailing any serious inconvenience. This fact is made use of by those who advocate the stitching together of the two wounds, and there has been proved to exist, in some of those cases in which the Cæsarian section has been repeatedly performed, an extent of adhesion which has admitted of the performance of the operation without opening the peritoneal cavity; and it is obviously to this fact that the exceptional success attendant on such operations is to be attributed.

Gastrotomy, or *Laparotomy*, is an operation which has already been alluded to as applicable to cases in which the child has escaped into the abdominal cavity, either from a ruptured uterus, or in cases of extra-uterine pregnancy. Some of the older cases which have been recorded as Cæsarian section have clearly been of this nature,—the operation being, as is obvious, only one stage of the more formidable procedure which we have been considering. There may possibly be cases, moreover, as has already been shown, in which, although the cyst of an extra-uterine conception has not been ruptured, it is necessary to perform this operation when the life of the mother is threatened by pressure on important organs, and also under some other circumstances of a like nature.

The operation is simply the first stage of the Cæsarian section, and is to be conducted with precisely the same precautions; but an aperture must be left at the lower part of the external wound to permit of the escape of the discharges. It might naturally be inferred that an operation which does not involve the uterine walls, would be attended with much more favorable results. In practice, however, we shall probably, when we take the whole circumstances into consideration, look upon the one with as great apprehension as the other. The operation of Gastrotomy has, in fact, certain special dangers in the practice of midwifery, and is very different, in all respects, from the ordinary operation for the removal of an ovarian cyst. The conditions which attend rupture of the uterus, or of an extra-uterine cyst, have already been detailed, when those accidents were under consideration. In each case, the ovum, its appendages, and the liquor in which it floats, all escape into the peritoneal cavity, along with a large quantity of fluid and clotted blood,—a portion of which must necessarily be left behind,—so that the chances of peritonitis are probably not less in the one case than in the other. And, in the case of extra-uterine pregnancy, the peculiar anatomical conditions which are often involved in the nature of the placental attachment, are of such a nature as to render these cases desperate in their character. In fact, whatever statistics may seem to prove, and Kilian and a few others may have said, we must always look upon this operation as one of the last resources of our art.

When the child is extracted by means of incision, practiced from the vagina, the operation has by some been termed Vaginal Cæsarian Section, a phrase which is obviously improper. The circumstances which may render necessary such an operation as this, are malignant disease of the os and cervix which renders dilatation impossible, congenital

brim ; but a moment's reflection will serve to show that this operation is not one which is likely to reduce the diameter which is thus encroached upon, for, while it certainly will increase the circumferential measurement of the pelvis, and the transverse and oblique diameters, it leaves the conjugate comparatively untouched. And, if we turn to the results of the operation, we will at once find that the boasted advantage has no existence, save in the imagination of the inventor. Baudelocque says, that, in forty-one cases of the operation, fourteen women died, while only thirteen children were born alive. The narrative of recorded cases shows that, while the forces of nature *may* prevail after the operation, it will often be found necessary to apply the forceps, or turn, after the original operation has been completed. As regards ultimate results, Cazeaux says, "In the most fortunate cases, the consolidation of the symphysis is only complete after a lapse of three or four months. Women have been seen in whom it had never taken place, and who, nevertheless, have eventually been able to walk. There then forms, according to Alphonse Leroy, a fibro-cellular tissue, which, filling up the gap in the symphysis, maintains the solidity of the articulation."

Various modifications of the operation have been suggested, including one method, which has received the support of Stoltz of Strasbourg, and which he termed *Pubiotomy*. In this case the operation is performed by a chain saw, which is introduced subcutaneously. A small opening is first made to the right or left of the middle line over the pelvic crest, and through this a strong needle, slightly curved, is introduced. This is passed behind the pubis, and brought out by the side of the clitoris, and by it the chain saw, to which it has previously been attached, is pulled through, and made to act upon the body of the pubis from within outwards, until the bone has been divided. The operation of symphysiotomy has been but once practiced, in so far as we are aware, in this country ; and on the Continent, in the present day, it is so seldom employed that the question may now be looked upon as forming little more than an episode in the history of the operative midwifery of the past.

It may be interesting at this place, by way of recapitulation—but without any pretence of or attempt at anything more than an approximation at accuracy—to set down, in a tabular form, the various conjugate measurements at the brim which, according to the best authorities, may be supposed to indicate the necessity for the several operations which we have now been considering. Burns, speaking of one of the operations referred to, says—and the observation will apply with equal force to any of them : "There is only one degree of disproportion, then, betwixt the head and the pelvis which will admit of this ; but the smallest deviation from it destroys the advantage of the operation. Now, as this disproportion is so nice, we cannot in practice ascertain it ; for, although we could determine, within a hundredth part of an inch, the capacity of the pelvis, yet we cannot determine the precise dimensions of the head, and thus establish the relation of the two." The student, we would again repeat,—at the risk of being accused of unnecessary iteration,—must, above all things, beware of assuming that conjugate contraction is his only guide, or one which is uniformly to be

the vigorous support it received from many influential quarters, the operation was soon forced into notice. In 1556, a conference was held in London, which was attended by the most eminent practitioners of the day, at which this question was fully and exhaustively considered in all its bearings, with the result of formally admitting it as a recognized practice of the English school.

For reasons which have already been more than once adverted to, the induction of premature labor was not likely to obtain a ready assent on the Continent, where, on the contrary, it found opponents who were so virulent in their hostility that an operation, which is perhaps above all others morally right, as well as beneficent in its action, was for many long years contemptuously rejected. The great force of truth, however, ultimately prevailed, and the operation was performed in Germany by Wenzel, in 1804; but it was not till 1831 that Stoltz, of Strasbourg, led the way by performing the first operation in France—not the least of the benefits which this distinguished obstetrician conferred upon that branch of science with which his name is still honorably connected. From this moment the success of the operation was assured, even in the country where it had been longest resisted. Sentimental scruples in regard to foetal life, which had swayed the opinion of many, were shown to be in this case quite irrational, and could be supported by no argument, moral or religious, the sophistry of which could not easily be expressed. And as time wore on all doubt vanished, and it may now be said that in the present day the practice of the Continent is as advanced as it is in England, and perhaps of late years has attracted even more attention than with us. The only remnant of the original prejudices, which still exists in the minds of some, is the opinion, occasionally entertained, that we should not perform the operation repeatedly upon the same woman, on the principle which has induced these persons to bring the interests of the child into greater prominence in the case of a woman who has once been delivered by craniotomy, and who ought, therefore, according to them, to be exposed to the fearful danger of the Cæsarian section, in order that the infant may be born alive.

The Induction of Premature Labor, in its widest sense, is an operation varying greatly in its details, whereby the uterus is artificially stimulated to expel its contents at any period prior to the completion of the full term of utero-gestation. The merest glance at the subject will therefore suffice to show that the operator must feel the sense of responsibility more the earlier the period of pregnancy at which the presumed necessity for the operation may arise. At the sixth, and at the ninth month, the operation will differ in no essential particular, and may be attended with equally trifling risk to the mother. But in the one case we sacrifice a child, by bringing it into the world before it is viable; while in the other we merely induce the premature expulsion of an infant which there is every reason to suppose may survive; so that we must carefully draw a distinction between the induction of *abortion* and of premature labor in its more restricted sense. The general opinion, which has found expression in the "Code Napoléon," is, that the end of the sixth month is the period at which the foetus

tion—may have this effect; and it is, probably when the disease is rapidly progressive, towards the end of pregnancy that we are able, by premature delivery, to avert its otherwise inevitable effect on the life of the child by placing the latter in circumstances in which, aerial respiration having been established, it is independent of the placental circulation.

It is, as we have seen, a natural physiological accompaniment of pregnancy, towards its period of termination, that the utero-placental tissues loosen somewhat, preparatory to the occurrence of delivery; and when no actual disease of the placenta can be discovered, it has been supposed that premature separation of the decidua may, either by rupture of the vessels, or by interference with the circulation within them, directly or indirectly destroy the foetus. In some cases,—of which we have seen two examples,—it would seem as if the uterus, as in habitual abortion independent of disease, had assumed a habit of throwing off its contents at a certain time, before the conditions otherwise favorable to live-birth were in operation; and yet when this so-called habit is once broken by the induction of premature labor at a somewhat earlier period, the woman, in subsequent pregnancies, carries her children to the full time. The operation may even be warranted in cases in which, although the children may have previously been born alive, they have, owing to the occurrence of some of the diseases referred to, been the subjects of what has been termed, with some propriety, “intra-uterine marasmus,” and have not long survived their birth. In cases of still-birth, a very excellent rule which has been laid down for our guidance in subsequent pregnancies is to examine with great care the placenta and membranes.

The cases which are most frequent in their occurrence, and at the same time, most satisfactory in their results, are those in which we operate with the double object of saving both mother and child from great peril or almost certain death. Merriman has insisted, with great justice, upon the caution which we should exercise when the conditions which seem to indicate the necessity for premature delivery occur in primiparæ. To a great extent, this warning is sound and judicious, but we must avoid carrying the principle too far; for, if the circumstances are such as seem to preclude the possibility of the passage of a mature foetus at the full term, we are equally justified, in primiparæ, as in other cases, in having recourse to an operation which thus obviates inevitable risk. In pluriparæ, much, and possibly everything, will depend upon the history of former labors. If, for example, it has been found necessary, once or oftener, to relieve the woman in previous labors by the operation of craniotomy, or even by turning or the long forceps, with an invariably fatal result, the estimate which we may be inclined to form of the probable danger is thus corroborated by experience; but, where the indications are less certain, we must be firmly convinced that the operation gives the best chance to the child as well as to the mother before we can hold ourselves as warranted in acting.

Inasmuch as the life of the infant will depend, in all cases, upon the degree of development which has been attained prior to birth, it is of the first importance that we should form a correct estimate of the period beyond which we cannot safely go. As the necessity for this

which she has fallen, and at the same time may be the means of preserving the child.

But, in addition to these, which clearly point to the operation, there are many other instances which may fairly be admitted to stand in a more doubtful category. When a woman, for example, is, towards the end of pregnancy, affected by a serious disorder, which apparently places her life in immediate jeopardy, it cannot fail to be a matter of anxious consideration whether or not we are to reject the operative means which we have at our command, which will generally save the child, and may often save the mother. Here, as in all other cases, we must place the interests of the mother before those of the child. It will not be a safe rule in practice, although it may seem so in theory, that we may operate to save the child, if we are persuaded that, by so doing, we shall not augment the danger of the mother; so that we should, in such cases, operate only when we can convince ourselves that the procedure is also, in the main, one which affords the mother the best chance of her life.

Cases of this kind, under a variety of forms, occasionally occur in practice. In dropsical effusions into the great cavities, to such an extent as to interfere seriously with the functions of respiration, no profound consideration is required to show that the distension of the uterus is an element or unit in the mechanical causes which place the woman's life in peril; and it is, at least, a reasonable assumption that, by subtracting this unit from the sum-total of unfavorable conditions, we give the mother an additional chance, while we withdraw the child from the operation of causes which may materially imperil its existence. Certain cases of cardiac disease, or of aneurismal tumors, in which the pressure of the gravid uterus seems likely to precipitate a catastrophe which we may regard as ultimately inevitable, may, on similar principles, be our warrant in inducing a premature expulsion of the uterine contents; but, in the course of practice, other exigencies may offer themselves, in which, while the indications are less clear, we may yet consider ourselves justified in bringing the pregnancy to an abrupt termination.

Several years ago, we had an opportunity of seeing a case of this kind in consultation with Dr. Dobbie of Ayr. The patient was a lady aged thirty, who had been for some years the subject of chronic asthma. She was, in the eighth month of her fourth pregnancy, laboring under severe chronic bronchitis, of a cyanotic appearance, and with an extremely feeble and irregular pulse. All the ordinary means, applied with much skill and discrimination, had failed to afford any relief, and it was therefore resolved, in the apparently desperate circumstances of the case, to have recourse to the induction of premature labor. Dr. Dobbie kindly supplied me afterwards with the following details of the issue of the case: "About eight o'clock on Friday morning, I made a vaginal examination, with a view to learn the exact position of things, and in doing so, I found the tissues all so lax and moist, and the uterus reaching so low in the pelvis,—almost touching the perineum,—that, without withdrawing my hand, I commenced dilating the os, first with my forefinger, and then with the fore and middle fingers. At the end

has still some supporters, is the ergot of rye. That this drug acts, in a large number of instances, through the spinal cord, so as to influence the fibres of the uterus, is a fact which no one can gainsay; but, in cases of abortion, and in all cases in which the uterus is in a state of quiescence, its action is more variable, and less to be depended upon, than when it is employed during labor. Still, it must, undoubtedly, be conceded, that premature labor has by this means frequently been induced, and although we are inclined to reject it as a means of causing primary contraction, there seems no good reason why we may not use it in many cases, as we would in labor at the full time,—to expedite delivery, or to sustain flagging uterine effort.

The other plan,—that of operating upon the ovum or uterus, so as directly to excite the contraction of the latter, has entirely superseded such of the more remote and indirect modes of procedure as have by some been practiced. We purpose to direct attention here to the more important only of the numerous methods which have been devised directly to effect contraction.

1. The original mode of procedure, which received the support of the London Congress, above alluded to, consists in the Rupture of the Membranes, by means of a quill sharpened at the point or in any other way which may be considered more safe, in order to permit of the escape of the liquor amnii, and the partial collapse of the uterus. This is a very certain and effectual method of inducing premature labor, but it was soon found to be open to serious objections. In the first place, it compromises very decidedly the chances of the child, by allowing the uterine walls to come in contact with, and injuriously press upon it, in its imperfectly developed condition, from the beginning to the end of labor. And, secondly, it is far from being free from danger, especially in cases of abortion, when, owing to the imperfect dilatation of the cervix, the membranes are difficult to reach; and many cases have occurred of serious and even fatal results, from injuries inflicted upon the cervical tissues in the course of those efforts, as has often been the case in recorded examples of criminal abortion. On these grounds, with the exception of certain cases of hemorrhage, in which, for special reasons, it is preferred to other methods, its use is to be condemned.

2. Separation of the Membranes, by means of the finger or sound introduced through the os uteri, was recommended and practiced by Professor Hamilton of Edinburgh; but it may fairly be assumed, that the result in such cases is due as much to the irritation and forcible dilatation of the os and cervix, as to the partial separation of the membranes, which is effected by sweeping the finger or sound round the uterus, so as to cause their detachment. Still, as the integrity of the membranes is in this way preserved, although, in many cases, it must necessarily be imperilled, this may be looked upon as an improvement upon the original process.

3. The Dilatation of the Os by tents has also been practiced with considerable success, but in this case something more is attempted than a mere excitement to contraction, in the forcible dilatation of the parts, by which the natural process is in some degree aided. This latter indication is, however, more thoroughly carried out in the method which

of the patient, when nothing is done to prevent the free escape of the fluid from the vagina.

The intra-uterine douche, which is generally known as Cohen's method, was first recommended by Schweighäuser in 1825. It was originally introduced as an improvement upon Hamilton's process, as, in its operation, it more thoroughly and effectually separates the membranes from their uterine attachments. Abundant proof has been afforded that this is an effective plan, but it remains for our consideration whether or not it is to be admitted as a safe one. Dr. Barnes has collected no less than ten cases in which a fatal result ensued from the employment of the uterine douche, in some from shock, in others, as has been assumed, from the passage of the injected fluid through the Fallopian tubes into the abdominal cavity, and in others, as in a case which he quotes from Ulrich, by the entrance of air into the circulation through the uterine sinuses. In two cases mentioned by Simpson, the cause of death was rupture of the uterus. "The occurrence," he says, "of the rupture was to be explained by the fact, that the uterus, being already fully distended, could not admit the few ounces of fluid without being stretched and fissured to some extent; and during labor these slight fissures might easily be converted into fatal ruptures. In one case, the patient died before labor was completed; in the other, in twelve hours after its termination." It has also been urged by the same authority, that the placenta may be detached by injection; and that the position may possibly be altered, so as to change a cranial into a transverse presentation.

While we cannot wonder that the methods above described have received much support from influential quarters, we fear that such results as have been reported must be taken as a sufficient warrant for the absolute condemnation of the syringe as a means of inducing labor. Some doubt may be admitted as to the original plan of Kiwisch; but, when this is combined with forcible distension of the vagina, by preventing the escape of the injected fluid, which is tantamount to Cohen's method, we feel that no evidence of mere efficiency, nor accumulation of successful results, will warrant us in exposing a patient to such danger, while, undoubtedly, safer means are at our command. Injections of carbonic acid gas, and of common air, within the cavity of the uterus have also been practiced, but with such results as to deter any one from such expedients in all time coming.

7. The most recent method of inducing premature labor, is that which was suggested about ten years ago by Dr. Barnes, of dilatation of the os and cervix by means of graduated fluid pressure. A similar mode of procedure had previously been attempted by Dr. Keiller and Mr. Jardine Murray, but it is to Dr. Barnes that we certainly owe the complete scheme of cervical dilatation, which is in the present day gradually making its way into practice. The plan originally propounded by Dr. Barnes commenced by forcible dilatation of the os uteri, and was one, therefore, to which the French opponents of the general scheme would have applied their favorite term *accouchement forcée*, with the full weight of the contemptuous epithet; and to the modified procedure which he now advocates the same term might still, in a modified sense, be applied.

in the management of this instrument, and especially of the stop-cock; but a close observation of the apparatus, and a few test-experiments before its introduction, will obviate any difficulty, and will at the same time serve to insure the efficiency of the bag. The process of subsequent dilatation should be gradual, and is effected by repeated injections, which, while increasing the size of the bag, exercises a pressure or dilating force upon the cervix, which is perfectly equable, and which is a pretty close imitation of the manner in which nature effects dilatation by means of the sac of the liquor amnii. It may be necessary to use successive bags, which progressively increase in size; or, in the absence of a sufficient assortment, two bags may be simultaneously introduced, and successively dilated, until the requisite amount of distension is attained. The only objection which occurs to us, as one which may possibly be urged against the use of this contrivance, is the chance of the displacement of the presenting part, by the expansion within the uterus of the fundus of the bag; but, in so far as experience has gone, in the hands of the inventor, or of those who have adopted his process, it does not appear that this objection has been experienced in actual practice. For our part, we have more than once had occasion to use the apparatus, and so far as a limited experience may entitle us to form an opinion, we can, in every respect, corroborate the assertions which have been made in its favor.

The methods of inducing premature labor which have been above detailed do not, it need scarcely be said, embrace all that have been suggested and practiced. At a very early period of the controversy, Galvanism was looked upon by some as an agent from which important results might be expected; but, although this is a powerful and undoubted provocative to uterine contraction in some cases, as has been shown by Dr. Radford and others, it is so uncertain, that its use has now been abandoned,—as has also been the case with regard to many other expedients, from which at one time brilliant results were looked for. Scanzoni has suggested an ingenious, but rather fanciful method, depending upon the well-known sympathy which exists between the mammæ and the uterus. He has applied—and in two cases, at least, with success—an apparatus of the nature of an exhausting syringe, or sucking-pump, over the nipple for about two hours, the irritation thus produced being propagated by sympathy to the uterus. Most of the other methods suggested are either modifications of processes already described, or are not of sufficient importance to require special consideration.

The condition of the ovum, the uterus, and the system generally, in reference to this operation, are obviously points of no little importance. The question of viability or non-viability of the foetus, having been determined by the period of pregnancy, the fitness, anatomically and physiologically, of the maternal parts, and, indirectly, of the general system of the mother, naturally attract attention. In deciding upon the operation, we necessarily resolve upon a proceeding which, in a manner, takes Nature unawares. The condition of the cervix, and the extent to which its cavity has been encroached upon, at various periods, in the course of pregnancy, have been fully referred to in a previous

cases in which the obstruction of the os is of a more serious nature, depending either upon peculiarity of structure or actual disease; and it has been in cases such as these, as was before mentioned, that the force of the uterine contraction is such as, in some rare instances, to separate the os and cervix, in the form of a ring, from the rest of the uterus; or, in some more common way, to produce rupture of the organ.

There are some cases in which there seems to be actual occlusion of the os, such as is sometimes observed in the unimpregnated uterus. Impregnation in the case of an absolutely occluded os is as impossible as that the normal function of menstruation should be carried on; and, therefore, we must assume, in such cases, that the closure must have taken place subsequently to the entrance of the seminal fluid. It is, of course, possible, that the os may remain open to a very limited extent, and yet the state of the tissues render distension impossible, so as practically to constitute an impediment as insurmountable as actual occlusion would be. In cases of anteversion of the gravid uterus, which is associated with pendulous abdomen, one result of the displacement is that the os uteri is tilted upwards and backwards beyond the reach of the finger, a condition which might readily enough be mistaken for occlusion, unless the observer should take the precaution to introduce the hand within the vagina, so as to explore thoroughly that part of it which is towards the hollow of the sacrum. Injuries, the result of former labors, the indiscriminate use of cauterants, and some other similar causes, may give rise to a species of callous rigidity, which is scarcely to be overcome by any means short of actual incision; and, in the worst cases of all, in which the tissues are the seat of induration from cancerous disease, the barrier may be so impassable as to render necessary the desperate expedient of the Cæsarian Section.

If, in an obstinate case of simple rigidity, the ordinary means of bleeding, tartar emetic, &c., have failed, we might try belladonna in the form of injection, the use of which has been much extolled by the French accoucheurs; but this is an expedient which is to be resorted to with caution, as faintness, headache, vertigo, and the other constitutional effects of the drug, are apt unexpectedly to be induced. The cases, according to Cazeaux, in which belladonna is most likely to do good, are those in which there is not rigidity, but spasmodic contraction of the fibres of the neck, an active and not a passive force. Although the os may, in ordinary cases, with scarcely an exception, be readily detected by the finger, it would appear that there are instances in which, although it has been impossible to feel it, its presence has been revealed to the eye by the speculum. This at least is an assertion which has been made by some whose opinions must always command respect, but it appears to us that the difficulty of using the speculum in labor, and the impossibility of recognizing the os when, in cases of difficulty, it is high in the hollow of the sacrum, must render this mode of investigation a very unsatisfactory one. The treatment of labor obstructed in this way may come to be a matter involving considerable perplexity. If the os, or the situation where surrounding induration marks the point at which it has become occluded, can be discovered, mechanical

inal and vaginal exploration—may best be remedied by raising the depressed fundus, and maintaining it in that position by a bandage. In this way the axis of the uterus is brought more into coincidence with that of the brim—a result which may be still further insured by a supine position.

Posterior and lateral obliquities have also been noted as impediments to delivery; but to these unnecessary prominence is given by most Continental authorities. In the former case the os will probably be discerned in front, behind the symphysis; and in lateral obliquities, of which, for obvious reasons, the displacement of the fundus to the right is the most frequent—the os will be directed to the opposite side. Although practical difficulty from this position is rare, it may happen that the head remains above the brim, while the shoulder which is lowest in the uterus, slipping down, becomes the presenting part.

An abnormal condition of the vulva and vagina, congenital or otherwise, may sometimes cause serious obstruction to the course of labor. Union of the labia and nymphæ may exist to a greater or less extent, and as the smallest possible vaginal orifice is all that is essential to impregnation, an obstacle of this kind, whether congenital or the result of cicatricial union and contraction, may require the aid of art. The persistence of the hymen is another condition of a similar kind, which has sometimes been observed to such an extent as to constitute an impassable barrier. An extreme rigidity of the external parts has been noticed, chiefly in the case of women who become pregnant for the first time, either at an advanced age or very young. This rigidity of the perineum will generally yield to the vigorous pressure of efficient labor pains; but it sometimes happens that the resistance is obstinate, and requires assistance. In all these cases incision should not be practiced until the head has descended to the perineum, and then only to such an extent as may be absolutely necessary, remembering always that a trifling incision thus made will be extended as the head advances.

Our anxiety, in such circumstances, would be chiefly directed to the perineum, a laceration in which may, as we have seen, prove a very serious matter, by running back into the rectum. In order to avert such a catastrophe, therefore, we should make the incision, not in the middle line, but on either side, so as to direct the tear laterally and not posteriorly; and, even when such lacerations may have a formidable appearance at the moment of birth, they will rapidly contract, and a few days afterwards will be no longer visible. If the obstacle depends—whether in the vagina or at the orifice—upon contraction which is the result of disease or previous laceration, the difficulties of the case may be very great. Not unfrequently, the cicatrices are formed of strong ligamentous bands, which prevent the distension of the vagina, and may even pass across from one side of the canal to the other as imperfect septa. It has been recommended, when this is recognized early, that gradual dilatation should be attempted by means of tents or bougies. In the minor cases, the stricture will ultimately yield before the pressure which, during labor, is brought to bear upon it from within; but, in the worst cases, operative interference will be required. It has been found that free incision of such vaginal cicatrices is apt to be followed

avoided, gangrene or suppuration may ultimately be the cause which leads to the fatal result. We have at present nothing to do with the treatment of thrombus occurring during pregnancy or after labor, but in those cases in which it constitutes an actual obstacle to delivery, nothing is open to us beyond free incision, which may be made in the most dependent portion of the tumor, and of such size as its dimensions may seem to render necessary. The immediate effects of gangrene and suppuration, and their probable results, will, of course, in such a case, excite, and with good cause, the serious apprehension of the accoucheur. Among the other tumors which may be encountered during labor, we may mention, in addition to those which have already been detailed, phlegmonous enlargements, cysts, syphilitic vegetations, and such tumors as have been figured by Martin in his "Atlas," as due to hypertrophy or degeneration of the nymphæ and preputium clitoridis,—all of which must be managed on ordinary surgical principles.

Polypoid tumors, springing from the uterus, may sometimes constitute very serious obstacles to delivery, as is here shown. The mere

FIG. 176.

Uterine polypus as an obstacle to delivery.

existence of a tumor of this character is not, however, to be accepted as evidence of a condition which absolutely prohibits the passage of the child, as much will depend upon the mobility as well as the compressibility of the tumor. In a case published by Dr. Beatty, to which Dr. Churchill refers, "the tumor was so large and apparently so fixed, that Cæsarian section was anticipated; nevertheless, at the time of labor, it was elevated sufficiently to allow of the birth of the child without any assistance." In some cases of polypi with a narrow pedicle, the effect of continued pressure and extensive effort has been to detach

foetus. This will depend in a great measure upon the structure of the tumor. Such growths are, as is well known, most frequently cystic in their nature, and, consequently, admit of a considerable amount of flattening, which would also be encouraged by the elasticity of their walls. The benefit of this mechanical advantage may, however, be lost by the nature of the pressure which is exercised by the advancing head; for if the higher part be firmly pressed, as is quite possible, between the head or other presenting part and the pelvic brim, so as to bring the walls of the cyst into complete apposition, the lower portion may bulk still more prominently during a pain, and be rendered at that moment harder and more resistant. We should not, in such a case, confine ourselves to vaginal exploration, but endeavor, by the introduction of one or more fingers into the rectum, to ascertain the nature of the case, with such precision as may be possible under the circumstances.

The treatment applicable to these cases must obviously depend upon the information to be derived from such examination as may be practicable. If the volume, seat, and nature of the tumor seem to encourage the belief that the force of nature may prevail, we should do nothing further than, by securing an empty condition of the bladder and rectum, make sure that no extraneous influence exists which may further complicate the acknowledged difficulties of the case. If, however, a purely expectant treatment should not result in the progress which we desire, it will be proper to attempt to push the tumor beyond the upper boundary of the pelvis; but if it should show a tendency to fall back, which it will generally do during the interval between the pains, we may attempt to retain it in such a position as may enable us to apply the forceps or to introduce the hand for the purpose of version, in which latter case the arm of the operator in the vagina will prevent the tumor from again descending towards the floor of the pelvis.

In cases in which the descent of the head, or the existence of adhesions, renders any displacement of the tumor impossible, it is even of greater importance that we should recognize, what is not always an easy matter, whether or not it is cystic. If so, and we leave it to nature, the result will probably be either rupture and escape of its contents into the cavity of the peritoneum, or a violent inflammatory action, the result of pressure. The puncture of such cysts from the vagina, as advised by Merriman, has been practiced with perfect success, and is obviously the only method of treatment which is open to us. To obviate the possibility of an error in diagnosis, an exploratory trocar should, in the first instance, be passed into the tumor, and when its nature is thus conclusively demonstrated, a larger trocar and canula may be employed, and the contents as thoroughly as possible evacuated. Complete success can, under such circumstances, only be counted upon when the cyst is unilocular; but, when it is a multilocular cyst, or the contents are unusually thick, it has been found necessary, in order to lessen the tumor, to incise from the vagina, a mode of procedure which, although dangerous, is probably less so than the doubtful results of the accidents which we have indicated as likely to supervene. Some have proposed puncture by the rectum; but, as the dangers of this operation

pregnant, we may be pretty sure that unless special care be taken at the time of delivery, difficulties are extremely likely to arise. The impediment will best be obviated by the opportune use of the catheter; and, if the cystocele already exists as an obstruction, care must be taken to pass the catheter backwards into the tumor, or to raise and press upon the latter so as to insure its evacuation. Caution must be exercised in the diagnosis of this affection, for it has happened that the fluctuating sac has been mistaken for the membranes, and perforated with the view of giving exit to the liquor amnii, the assumed cause of the obstruction. It has also been mistaken and punctured, in a case reported by Merriman, for a hydrocephalic presentation.

An interesting illustrative case, in which the tumor was of considerable size, is narrated by Madame Lachapelle. "The first thing," she writes, "that attracted attention was a pediculated tumor, about the size of an egg, which, projecting a little from the vulva, seemed to be attached to the anterior and right wall of the vagina, about its middle part. The pedicle was about an inch and a half in thickness, and the tumor contained a fluid which could be completely pressed out of it through the pedicle, when we were able to feel an aperture with thickened borders, which appeared to me to communicate with the bladder. In reference to the position of the woman, it was found that the tumor increased in size in the erect posture; it often disappeared after micturition, and was always retracted under the influence of a cold bath. The uterine contraction increased the volume of this hernia, and the head, in its descent, pushed it in advance, and stretched it strongly. I reduced it after having emptied the bladder, and I recommended the pupils to support it with two fingers during each uterine contraction. The head soon cleared the passage, and itself retained the hernia, and the labor terminated happily."

A urinary calculus may, of course, coexist with the pregnant state, but will usually produce no effect, mechanical or otherwise, upon the progress of gestation. In rare instances, however, it has been found that the stone has been so placed as to be imprisoned in the lower segment of the bladder by the pressure of the head of the child against the pubis. The advance of the head still further tends to confirm this position, and ultimately the stone, encroaching as it does upon the calibre of the pelvic canal, constitutes a serious impediment to delivery. The diagnosis is not always easy, but if the tumor behind the pubis is hard, circumscribed, and evidently situated beyond the pelvis; if it is fixed during contraction, and movable during the relaxation of the uterus, the symptoms are sufficiently significant to indicate the use of a sound, which will at once disclose the nature of the case. The circumstance in which a calculus is most likely to be an obstacle to labor is when it is complicated with vaginal cystocele—an anatomical condition of the parts obviously favoring the descent of the stone by gravity. Smellie gives among his cases that of the wife of a coal porter, who, having long suffered from the symptoms of stone, became pregnant. She was attended during labor by a midwife, who recognized the presence of a hard body in advance of the head; but her resources being limited, she was content to wait and watch the progress of events.

of other characteristic signs, may invest the case with considerable obscurity. The treatment in all cases is the same,—to practice the taxis, and maintain the displaced viscus in its proper situation while labor is in progress, with the object, as we have said, partly of preventing the possibility of mechanical obstruction, but mainly with the view of protecting the displaced parts from injurious pressure.

The various tumors which have been described do not, it need scarcely be said, embrace all the varieties of obstacle from these sources, which may be encountered as impediments to the progress of labor. Fibrous, fatty, or encysted growths may spring from any portion of the cellular tissue of the pelvis. The direction which these most frequently take, is that of the recto-vaginal pouch, but they have also been observed in the sides of the canal, and even between the uterus and the bladder. To distinguish such abnormal structures from those which have their origin in the tissues of the various organs which are situated in the pelvis will always be a matter of difficulty, sometimes of impossibility. Everything will depend upon the mobility and compressibility of such tumors, and the result, in many cases, will simply be an increased difficulty in the passage of the child, the forces of nature ultimately overcoming the obstacle.

But, in some cases, the volume and immobility of the tumor may be such as to preclude the possibility of any such favorable result; and, in that case, we may be forced to adopt such surgical means as may with the least risk get rid of the difficulty. If it is a cyst, it will be proper, therefore, to evacuate its contents; and, if solid, its size, shape, and the nature of its connection by adhesion or otherwise, must serve as our guides to such operative measures as, on general principles, the nature of the case seems to demand. Excision of such tumors is, of course, under these circumstances, an operation which is attended with peculiar risk: it has been practiced by an incision through the vaginal walls; and, in some other cases, with success, by a more extensive incision involving the thickness of the perineum. The worst cases are those in which the size of the tumor, its immobility, and the great extent of its adhesions, render such operations impracticable; and, in these, nothing will be left to us beyond the more desperate resources of operative midwifery.

Frequent reference has been made to malignant tumors as obstacles to delivery. The nature of this fearful class of diseases is such that the impediment may have its origin in the bones, ligaments, uterus, bladder, rectum, or any conceivable part or structure of the pelvic contents. Moreover, from a tumor of trifling size, it may attain dimensions which are only limited by the capacity of the pelvic canal; and the tendency of all malignant growths to invade contiguous textures frequently places the case in a category peculiar to itself, inasmuch as it is impossible to isolate it either for the purpose of removal or dislodgment. In the ordinary or scirrhus form, the stony hardness of the tumor, which is absolutely incapable of distension, the infiltration and infection of surrounding tissues, the binding together of the parts, the presence of ulceration, and the existence of marked cachexia, will generally render diagnosis a matter of no difficulty.

hydrocephalus, fluid distension of the great cavities of the trunk, and tumors of various kinds springing from its external surface. Hydrocephalus is, of all such affections, not only, as might be expected, the most important, from a mechanical point of view, but is so also in point of frequency. One form of this affection, or rather one which has been by many writers erroneously described as such, is an effusion of fluid beneath the scalp or pericranium, and, consequently, exterior to the cranial cavity. Examples of this, which has been termed external hydrocephalus, are very rare, and have usually been found to be associated with a general condition of infiltration affecting the whole of the external tissues of the foetus. It is a condition which usually involves the life of the child, so that any serious impediment from a child which is in all probability putrid need scarcely be anticipated.

The internal variety, or what is known as true Hydrocephalus, is a much more serious as well as a more frequent occurrence, and may exist to such an extent as absolutely to preclude the possibility of delivery by the unaided efforts of nature. In this case, the fluid, which is effused within the cranial cavity, varies greatly in quantity. In those instances in which the quantity is small, the difficulties of parturition may not be materially augmented, as the compressibility of the head is, in consequence of the nature of its contents, relatively increased—a condition which obviously tends to facilitate its passage, and compensates for the actual increase of bulk. Owing to this, indeed, and associated probably with ample pelvic diameters, very large heads have been known to pass naturally. In some cases, the head, in consequence of the quantity of fluid which is poured out by the morbid process, attains enormous dimensions. When the disease is slow in its progress, the flat bones become developed to a very unusual extent, but when more rapid, the deposit of bone does not keep pace with the distension of the head, and the latter, under such circumstances, may present itself under the form rather of a bag of fluid than of an ordinary cranial presentation. The rule certainly is that the process of ossification fails to overtake that of fluid distension, and a marked characteristic, therefore, of hydrocephalic heads is that the sutures and fontanelles are more apart than usual.

When the size of the head is considerable, and the symptoms consequently well-marked, the recognition of hydrocephalus is generally easy enough. The presenting part, which in these cases is arrested above the brim, is found to be less resistant and less convex than usual. The sutures and fontanelles are, however, to be distinctly felt; and, if we can feel that the former are agape, and the latter of larger size than usual, with more or less of a feeling of fluctuation, there will be little room for doubt. The existence of a large posterior fontanelle is particularly characteristic; and, if the hand can be fully introduced, the great size of the head will be recognized.

This applies, of course, to those cases only in which the cranium presents at the brim. It often happens, however, in such instances, that the same reasons which, under ordinary or normal circumstances, cause the head to adapt itself to the smaller end of the ovoid cavity of the uterus, operate by so determining the position, that what is here

the conclusion—point significantly to the danger that, in such cases, attends delay.

The indications of Treatment are, from one point of view, sufficiently obvious; but our action will, in no small measure, be swayed by the presence or absence of symptoms indicating the vitality of the child. If the child is dead, we do not require to wait for absolute certainty of diagnosis. Evidence of serious obstruction is all that, in such a case, we would think necessary to warrant us in perforating and giving vent to the fluid which is pent up within the cranium. But, when the child still lives, the responsibility which attaches to the operation is greatly increased, and the error which, in such cases, is most likely to be committed is that the operator may wait until the mother has become exhausted or the child has died; whereas, he ought to have sooner recognized the fact that the passage of a living or viable child was impossible, and have acted upon the principles which we have already laid down as applicable generally to cases of destructive or sacrificial midwifery. The immediate effect of craniotomy, in hydrocephalus, generally is to reduce the bulk of the head by the escape of a large amount of fluid, to an extent much greater than obtains when perforation is practiced under other circumstances. It may happen, as in some recorded cases, that the operation, as well as the diagnosis, may be complicated by the coexistence of what has been described as “external,” along with internal hydrocephalus, when it may be necessary to evacuate the external accumulation of fluid before piercing the cranium. To such an extent does the distension sometimes occur that several pints of fluid have been removed by simple perforation, when collapse of the cranium usually takes place, so as to permit of the expulsion of the head under the influence of the natural efforts.

It has happened that, after perforation and evacuation of the serum contained within the cranium, the child has been born alive; so that, although the chances of a child surviving under such circumstances may be considered as extremely small, it has been urged by Cazeaux and others that the operation should be so performed as, if possible, to prevent laceration of the cerebral structures, and the inevitable sacrifice of the child which must thus ensue. It has been suggested, therefore, that, on this account, the ordinary perforating apparatus should be rejected, and a simple puncture effected, by means of a trocar or a guarded bistoury, sufficient to penetrate the membranes through a fontanelle or suture, and nothing more. From what has already been said, it will be apparent that, in the minor cases, any mode of procedure which may promote lateral compression of the head may, with possible advantage, be adopted in preference to craniotomy. With this in view, therefore, it is usual and proper to attempt delivery, in the first instance, by means of the forceps, when the compressing power of that instrument may be employed to a somewhat greater extent than is usual under ordinary circumstances; but, if this fails, and the circumstances of the case are otherwise such as to preclude the hope of expulsion by the unaided efforts of nature, the more serious operation should be practiced without delay.

If the difficulty should arise in a presentation of the pelvic extrem-

mination. Tumors have, for example, been observed, which had their origin in the liver or the kidneys, enlarging the trunk to an enormous extent, so as absolutely to prevent its passage, and render indispensable the operation of embryulcia, in the course of which it may be necessary to break up the tumor, and remove it piecemeal before we can complete the delivery. Another rare condition of the foetus, which may be a very serious obstacle, is ankylosis of the articulations, and the same may be said of those cases in which there has been intra-uterine fracture as the result of violence, the limbs having united at an angle. It is difficult to say what, under such circumstances, should be done, if the condition has been recognized before birth: but, in so far as ankylosis is concerned, we may assume that the joints will probably be united while the limbs are flexed upon the body in the usual attitude of the foetus, and that the conditions are therefore not altogether unfavorable to the natural termination of labor. A more serious impediment has been in some instances found to arise from premature closure of the sutures and fontanelles. This, in a perfectly normal condition of the parts otherwise, may give rise to great delay, if not impaction, by its being impossible for the head to adapt itself in any way to the shape of the passage; and, as Dr. Tyler Smith has observed, the dangers of such a condition are not limited to the mechanical hindrance to delivery, but may be looked upon as an extremely probable, if not certain cause of idiocy, by preventing the development of the brain.

The child sometimes, even when not retained within the uterus beyond the ordinary period of gestation, attains a size so greatly in excess of the ordinary standard, as to cause a very difficult or dangerous labor. If we take, as has already been stated in round numbers, the average weight of the fully developed foetus as seven pounds, we are not astonished when we find in practice, that when this approaches twelve pounds the labor is, unless the maternal parts are of unusual capacity, a slow and painful one. But, when it reaches fourteen, fifteen, or nearly eighteen pounds (as in one well-known and authentic case already cited) it is difficult to conceive how by any possibility such a child could pass. If, however, we look closely at children which are much above the average, it will be observed that the increase in weight is to a great extent due to the development of fat beneath the skin, so that it is the trunk and limbs, rather than the cranium which is increased in size, and it is on this account that we find the powers of nature sufficient for the expulsion of the child. If the increase of bulk has been the result of a protracted sojourn of the foetus in the womb, the case will probably be more serious in its nature; and, certainly, in all such cases, we may be sure that the maternal as well as the foetal mortality will be increased relatively to the size of the child, as statistics tell us that this is the case, even as regards the comparatively trifling difference which exists between the male and female cranium. It is, however, very rare that, in the absence of pelvic deformity, cases of unusual foetal development may not be delivered by the forceps or turning, which we may term the minor operations of midwifery.

The occurrence of Plural Pregnancy may in various ways give rise to difficulty, and even to serious obstruction. In the case of multiple

without impediment; but when serious obstruction occurs, and we are thus led to make a more particular examination, it is discovered that the descent of the head is obstructed by the presence in the pelvic cavity of the head of the second child, which has caused the chins to be so hitched together that the completion of the first birth is rendered a matter of impossibility, unless the twins are small or the pelvis large. If, under such circumstances, we pull upon the body of the partially born child, we only make matters worse by locking them more firmly together. In some cases, when the condition of the parts is such as to admit of it, it may be possible, by pressing back the heads in the direction of the uterus, to unlock them, and then to permit of their descent singly. But, if this endeavor should fail, it will become evident that the only way to disengage them is to break up the compound wedge and thus admit of the passage of one or other of the children.

This may be effected in two ways, as has been well demonstrated by Dr. Barnes; either by decapitating the first child, which we have the least chance of saving owing to the pressure which is being exercised on its umbilical cord, or by perforating the head of the second child, so as to admit of the passage of the first. In the first case, the body which occupies the vagina will at once pass, and its head receding will admit of delivery of the second child by the forceps; and in the second, which is only justifiable when we have reason to believe that the other child is dead, we allow the perforated head to be flattened to such an extent as to admit of the passage of the head of the first, through the diameters which the operation has succeeded in reducing. This latter plan will have the obvious advantage over the former that the difficulty of extracting the severed head is thereby avoided.

There is another form of locking, in which both of the twins present—as is most frequently the case—by the head. The first head passes in this case without difficulty into the pelvis, but the head of the second, descending along with the trunk of the first towards the brim, prevents further progress by presenting the bulk of a head and a thorax simultaneously at the brim. The mechanical management of such a case as this may be a matter of even greater difficulty than the former. Perforation of the head which is within reach can obviously do no good, so that it is only by guiding the perforator upwards to the second head, and reducing its bulk in the usual way, that the operation may be, with any hope of success, adopted. In such cases, as has been shown by the experience of Dr. Graham Weir and others, it may be possible by dexterous manipulation to obviate the serious difficulties which exist. It has been found practicable in this way to extract by the forceps the child which originally presented while the head of the other was pushed aside by an assistant. External manipulation has also succeeded in skilful hands in forcing onwards the head which was situated highest in the pelvis, and thus causing it to take precedence of that which originally presented. All cases of locked twins are, however, serious complications, and are therefore with justice looked upon as among those dangers against which the operator should be prepared.

The first or second child may present in a preternatural manner,—

made above, delivery was accomplished with the greatest possible difficulty. It was a primiparous case, and the breech was the presenting part, everything going on well until the heads entered the pelvis, when complete arrest took place. The crotchet failed completely, and as Dr. Mather thought that the head was too high to use the perforator with safety, he attempted, by means of steady traction, to bring it more within reach, when, to his astonishment, two heads descended, situated obliquely, with reference to each other, in the pelvis, so that the one

FIG. 178.



Double-headed monster.

FIG. 179.

Double monster.

was a little in advance of the other. In this way, and after long-protracted efforts, the heads, which were quite the average size, passed. The pelvis was, as might have been expected, a capacious one; but even this does not make the case less interesting. The mode of delivery described by Meigs is generally supposed to be the only possible way in which such a child can be born without perforation or decapitation; but the case above given, which is extremely rare, if not unique, shows that if the other be the rule, it has at least, like many other rules, exceptions.

In that class of cases in which there is one head and a double condition of the lower parts of the body (*Janiceps*), the difficulty is not likely to be so great, as it is much more conceivable that two pelves could be sufficiently pressed together during their descent as to admit of their simultaneous passage through the pelvis of the mother. The monster here shown, from one which was described by Dr. J. G. Walter, has three legs and four arms. Complete fusion of the pelvis was found

this way likely to occur; but the evidence which has been advanced in favor of the contrary view seems pretty clearly to show that in cases of protracted labor, which have only terminated after rupture of the cord, the probable cause of the delay must have been the extreme shortness of the link which bound the foetus to its utero-placental attachment.

What is certainly of more frequent occurrence than actual shortness of the cord is—what has mechanically precisely the same effect—coiling of the cord round the child. In such cases there is usually not only no shortening of the cord, but an undue length of it, which is the original cause of the coiling which takes place round the neck more frequently than round any other part of the foetus. This artificial shortening is, we believe, of more frequent occurrence than is usually supposed; and every practitioner knows that few things are more common in practice than to find one, two, or more coils of the funis round the neck of the child. The exact stage of delivery at which arrestment from this cause is most likely to occur depends upon the length, or the length exclusive of coils, of the cord; but as a rule it would appear that it is seldom that much inconvenience is complained of until the stage of expulsion approaches, when, for the first time, the cord is put upon the stretch, and pain is, probably, to some extent, complained of in the region of the uterus. It has been stated, as a symptom during labor of shortness of the cord, that if the placenta is attached at its usual site, a depression of the fundus occurs at every pain, the rounded form being restored in the interval. That such an occurrence may take place, it would be impossible to deny; but it seems to us pretty clear that this is one of the instances, of which illustrations are too frequent in medical literature, where what we may call a theoretical symptom is set down as a real or practical one.

It has frequently been observed, when the cord was coiled round the neck of the child, that progress was for the first time arrested during or after the birth of the head. This has probably, to some extent, led to the routine practice of disengaging the coils as soon as their presence is detected, although the main cause undoubtedly is a dread of suffocation of the child by pressure on the respiratory passages. It has in some instances been found necessary, when the cause of the obstruction was evident, to cut the cord, a course of procedure which must recommend itself to the operator when the nature of the case is obvious. Caution should of course be exercised to prevent hemorrhage from the cut vessels by placing a ligature speedily on the umbilical side of the section; but it has been pointed out that a slight discharge is rather favorable in its effect than otherwise when asphyxia is threatened—a condition which may very probably be found to exist, along with the semi-apoplectic condition depending upon interruption to the circulation in the great vessels of the neck. In breech presentation, or after the performance of podalic version, the cord sometimes is found surrounding the trunk or entangled among the limbs, whence it will be proper to disengage it if possible; and if this cannot be effected, to cut it, rather than run the risk of obstruction in what, for the child at least, is always a critical labor. After such cases it is proper to intro-

CHAPTER XXXVII.

UTERINE INERTIA AND PRECIPITATE LABOR.

IRREGULARITIES IN THE PROGRESS OF LABOR ; OFTEN DUE TO INTESTINAL DERANGEMENT—INERTIA : INFLUENCE OF TEMPERAMENT, CLIMATE, AGE, EMOTION, EXCESSIVE DISTENSION, PREMATURE RUPTURE OF THE MEMBRANES, ETC.—INFLUENCE OF IRREGULAR UTERINE ACTION : UTERINE TETANUS—WIGAND'S CLASSIFICATION : DIFFERENT GRADES AND VARIETIES OF INERTIA—TREATMENT OF INERTIA ; IF FROM OVERDISTENSION OR DISPLACEMENT OF THE UTERUS ; IF FROM INTESTINAL DERANGEMENT—VARIOUS MODES OF EXCITING REFLEX UTERINE ENERGY—STIMULANTS AS A RULE TO BE AVOIDED—USE OF THE FORCEPS IN INERTIA—ERGOT ; ITS NATURAL HISTORY, AND PHYSIOLOGICAL EFFECTS ; RULES FOR ITS USE IN MIDWIFERY—OTHER OXYTOXIC AGENTS—PRECIPITATE LABOR ; CAUSES OBSCURE : APPARENT CONNECTION WITH MENSTRUAL EXCITEMENT—LABOR MAY BE PRECIPITATE FROM DEFICIENT RESISTANCE—DANGER OF RUPTURE AND LACERATION OF THE UTERUS—TENDENCY TO POST-PARTUM HEMORRHAGE—TREATMENT : EMPTY BOWELS : OPIUM : SOURCES OF REFLEX IRRITATION TO BE CAREFULLY AVOIDED.

IN no two cases of labor is the course of the process precisely similar, although the vast majority are from first to last perfectly normal. Nothing is more familiar to the accoucheur than the sudden and unlooked for changes which occur in the course of an ordinary case. In one instance, the tardy and inefficient progress which has characterized it during many tedious hours gives place, without any very obvious reason, to efficient and even violent action, which brings the act to a precipitate termination ; while, in another, the safe and steady progress which has led us confidently to anticipate a speedy issue of the case, is provokingly interrupted by a failure of expulsive power, and that too, not unfrequently, when the second stage of labor is nearly at an end. Such occurrences as these are generally of no great importance, and resolve themselves most frequently into a trial of patience, or a moment of hurry and excitement ; but cases do now and again occur, in which a failure of action or violence of propulsive force demands prompt and energetic treatment.

It has very frequently been observed that, in these matters, much depends upon the temperament and constitution of the mother ; so that, in members of the same family, in persons of similar temperament or constitutional power, and to some extent in those of similar social position, there will often be observed a certain resemblance in the character and progress of the labor. In some cases, in which the balance between power and resistance is in any way disturbed, it would almost appear as if nature availed herself of some special compensating condition which the exigencies of the case had called into play. The

distinct. In women, again, who become pregnant for the first time in advanced life, it is well known that labor, as a rule, is tardy; and, although the idea usually entertained is that this is due mainly to increased anatomical resistance, there can be no doubt that, in a certain proportion of cases, it depends upon deficient force.

In those who have borne many children in rapid succession, the action of the uterus is often found to become enfeebled towards the close of the childbearing epoch, probably because the organ has not had sufficient time for rest, and for the gradual development of those structural changes which succeed delivery, during and after the period of involution. The influence of emotional causes, although marked, is generally temporary; as is often seen on the arrival of the accoucheur, when it arises from fear. Any sudden alarm, startling intelligence, or anything which may give rise to sudden emotion, may produce precisely the same effect; and, although, as a rule, the uterus in such cases will, after an uncertain interval, resume its function, it occasionally happens that the pause is so long, or occurs at such a critical period in the labor, that it is necessary to have recourse to art to expedite or complete the delivery. The various displacements of the uterus, which act by altering the axis of expulsion, are often considered under this head; but that, which is a purely mechanical cause of delay, has already been referred to in a previous chapter. What is here implied by inert labor, has reference, almost exclusively, to a faulty condition of the expulsive forces, in which they are abnormally feeble and inefficient; and this feebleness of contraction may either exist throughout the whole period of labor, or may come on, more or less abruptly, in the course of a case which had, up to that time, progressed in a manner leaving nothing to be desired.

The Causes upon which a failure of uterine action depends embrace, in addition to those above mentioned, certain conditions of the parts, more or less strictly morbid. To these attention must be given, as it is manifest that a mere routine treatment, adopted without an intelligent reference to the circumstances of the case, must necessarily often fail of its object, and may sometimes only tend to make matters worse. Excessive distension of the uterus, by thinning the walls of the organ beyond ordinary limits, is one of the conditions to which we refer. The effect of dropsy of the amnion, for example, may in this way interfere with the due action of the organ; and, in such a case, less good will be derived from the exhibition of agents which excite the uterus to contract than from rupturing the membranes, and thus allowing the uterine wall to come into contact with the surface of the child, when it will in all probability be roused to active energy.

The death of the child was believed by Baudelocque to weaken materially the uterine contractions; but Dubois asserts, and modern accoucheurs generally agree with him, that when the woman is in good health, the death of the child exercises no influence whatever, in the way of enfeebling uterine action, and that if it sometimes happens that labor goes on more slowly when the child has ceased to live, this is to be accounted for by the fact that the death of the child is probably the result of some disease of which the mother has been the subject, and

is, so far, quite regular; but the contraction is incomplete, of short duration, and inefficient, and lasts longer at the fundus than in the lower segment of the organ. In the third grade, all pain in the uterus has ceased, so that, beyond a certain feeble tension, no trace of contraction is to be observed: this condition Wigand describes as *Lassitudo*, *Exhaustio*, or *Paralysis Uteri*. Scanzoni proposes that we should draw a distinction only between "primary" and "secondary" inefficient action, including, under the first term, all cases in which, from first to last, the womb lacks sufficient energy to complete the labor without assistance; and, under the second, those cases in which the contractions were originally sufficient, but have failed in the course of labor, so that, in the end, all the symptoms of primary inertia are manifested.

We doubt much whether any such system of classification is of value, either as a guide to practice or in elucidating the subject; and we therefore prefer, as embracing all cases of failure of uterine action, the simple term *Inertia*, which is generally used in this sense by English writers. Obviously, however, this may exist in any grade, from mere feebleness of contraction to absolute paralysis of the uterus. It is proper, in considering this subject, not to overlook the possibility of failure in the auxiliary expulsive forces; for it must be obvious that, in the course of the second stage, anything which may prevent the efficient action of the expiratory muscles must of necessity interfere, more or less, with the act of parturition. Acute or chronic pulmonary disease, therefore, as well as cardiac or hepatic disorders, and the ascites which often accompanies them, may, with other abnormal conditions, so interfere with the dynamical phenomena of parturition as very seriously to obstruct the progress of labor.

Treatment.—A careful consideration of the circumstances above mentioned, as applicable to individual instances, will always be our best guide to the treatment of those cases in which there is a failure of the *vis a tergo*. An error in the axis of expulsion, which is usually dependent on anteversion of the gravid uterus, and therefore does not strictly fall under our notice here, may be managed without difficulty, under ordinary circumstances, by postural treatment or by the abdominal bandage, so as to bring the axis of the uterus, as nearly as may be possible, into coincidence with that of the pelvic brim. Overdistension of the uterine cavity, by reason of dropsy of the amnion, plural pregnancy, or any other cause, should, if symptoms of inertia develop themselves, be treated by rupture of the membranes, and that for reasons which have already been stated.

Although, perhaps, rheumatism of the uterus has been somewhat exaggerated, as regards its importance as a cause of retarded labor, the symptoms should always be taken into consideration, as they are such as may divert our attention from the inefficiency of the labor. These symptoms have been well described by the younger Naegele. "Rheumatism of the uterus," he says, "is recognized by the following signs: During labor, and often before it, the uterus is unusually sensitive to contact, both from without and from within. The pains are feeble, short, infrequent, and unusually painful, and, in fact, excite as much pain at their commencement as normal pains do at the height of

which is thus exercised upon the uterine walls, and the increased efficiency with which the abdominal muscles are enabled to act. When a tendency to inertia exists, something will usually be effected by carefully watching the course of the labor, encouraging the woman to husband her efforts in the first stage, and urging her to make full use, during the second stage, of the expiratory muscles, by closing the glottis, fixing the limbs, and abstaining from crying during the presence of a pain.

In a certain number of cases, however, the uterus sinks into a state of complete inertia ; or the pains become so feeble that it is evident that labor cannot be completed by the unaided powers of nature. This condition is one which is often attended with no inconsiderable amount of risk, both to mother and child. If the failure should occur in the early stage of labor, before dilatation of the os has been effected, and the head has descended into the pelvis, we may place more confidence in nature, and may wait for a reasonable time, in the hope that more efficient action may be set up ; or we may employ the more simple means, which have been detailed, with the view of stimulating the uterine fibres to contract. When the os is fully dilated, or even, as we have seen at an earlier stage, when we have reason to believe that there is dropsy of the amnion, rupture of the membranes is a perfectly proper and justifiable procedure, and will often be followed, after a brief interval, by vigorous contraction. Should this fail, or should the inertia have become developed in the course of the second stage, we have then to choose between the forceps or some other mode of operative delivery, and the oxytoxic agents, of which the ergot of rye is by far the most important.

When the head is low, and the conditions otherwise are such as to render the operation both easy and safe, the forceps should, in most instances, be preferred ; and, in all cases in which the circumstances are such as to call for a speedy delivery, we should have recourse to this operation, or to turning. But, when the head is high in the pelvis, and there is no obvious necessity for rapid delivery, we may resort to some of the agents referred to.

Ergot, which is, as we have said, the most important of the class of drugs to which we refer, is to the accoucheur an agent so important and so powerful, that we may here interpolate a brief account of it, and of the rules which should guide us in its employment in the exigencies of ordinary practice. "The Ergot, or Spur," says Christison, "seems to affect occasionally all the Graminaceæ, more rarely the Cyperaceæ, and sometimes even the Palms. No plant, however, presents it so frequently, or of such size, as common rye,—the *Secale Cereale*. It is generally thought to arise under the influence of undue moisture ; and although this condition seems not to be absolutely essential, it is never produced with such certainty as in wet seasons, and in districts where the soil is damp, rain frequent, and the atmosphere still and misty, especially at the time the grain is coming into flower. In these circumstances, it is produced, according to some, by punctures made by insects in the glumes, while the substance of the seed is pulpy ; others conceive that it is caused by the spawn, or sporidia, of a peculiar

proper interval, although there may be regular periods of remission. This uninterrupted contraction of the uterine tissue necessarily involves a certain interference with the utero-placental circulation, over and above what occurs in the rhythmical contraction of ordinary labor; and it must be admitted that the absence of the natural periods of uterine rest may, if long-continued, place the life of the child in peculiar jeopardy. This, however, has, we believe, been greatly exaggerated. "The ergot," says Dr. Hosack, "has been called, in some of the books, from its effects in hastening labor, the *pulvis ad partum*; as it regards the child, it may, with almost equal truth, be denominated the *pulvis ad mortem*: for I believe its operation, when sufficient to expel the child, in cases where nature is alone unequal to the task, is to produce so violent a contraction of the womb, and consequent convulsion and compression of the uterine vessels, as very much to impede, if not totally to interrupt, the circulation between the mother and child." This assertion has been satisfactorily refuted by Chapman, Dewees, and others; but still we are inclined to think there is some grain of truth in it—at least in those cases in which labor is protracted in spite of strong and unceasing pains. Dr. F. H. Ramsbotham supposed that the toxic action of the drug might be extended from the mother to the foetus, and the figures which he gives would seem to go some way to prove his assertion. Of 36 cases in which he induced premature labor by puncturing the membranes, 21 children were born alive; while, in 26 cases in which labor was induced by ergot alone, 12 children only were born alive. Apart from the fact that such statistics are open to many fallacies, we repeat our conviction that the danger of ergot to the child has been greatly exaggerated; and we believe that the unsatisfactory results which have been reported have been mainly due to the rash administration of the drug, without any reference to the conditions upon which alone we can rely for a satisfactory result.

The violence of the contractions produced by ergot is such that we are never safe in administering it, unless we are convinced that the anatomical conditions are such as to admit of the passage of the child without extreme or unusual resistance. To give ergot, therefore, in a case of shoulder presentation or of deformed pelvis, when the os is undilated, or when the soft parts generally are rigid, dry, and undilatable, is manifestly wrong; and, in the first two cases, would amount to malpraxis in the worst form. As regards the condition of the os, the rule is as stated, but is not so absolute. If it were so, it would debar us from making use of ergot in the induction of premature labor, where its action initiates the commencement of the first stage. Nor, as regards ordinary cases, are we to admit that we must always wait until the os has become dilated; for there are instances, in which a dilatable state of the os, with a properly lubricated condition of the passages, would be quite sufficient warrant, in the absence of all action, for the administration of ergot. If labor should become arrested before the os has opened to some extent, there can be no question of medicinal treatment, as there is no risk either to mother or child in the arrest of a labor which has as yet barely begun. When the head is low in

practitioner such a rule is quite unnecessary, as he will not fail to take into consideration the greater resistance which naturally obtains in the case of a first labor. There is, in fact, if he does not lose sight of the special conditions referred to, no reason why he should not avail himself of the action of the oxytotoxic agents in primiparæ as well as in pluriparæ. For the guidance of the inexperienced practitioner, we will add one caution only—that he should not be too eager in his endeavors to bring a case to a speedy termination; for it often happens that a sudden cessation of the uterine efforts is merely an indication that the organ is collecting itself for more vigorous action and a final effort.

Precipitate Labor.—Although of less frequent occurrence than failure of the expulsive force, the accidents which may accrue in labors which are too rapid are scarcely less serious. In the great majority of all such cases, there is some peculiarity of constitution or temperament. It has, indeed, not unfrequently been observed in the same patient in successive pregnancies, and even in different members of the same family. It would also appear to be occasionally connected with a morbid irritability of the generative system, which may have been previously manifested in undue excitement at the menstrual periods. In some extreme instances, the action, from the very commencement of labor, is so severe that the patient is compelled to bear down from the first. The appearance and expression of the countenance, and the state of the pulse, denote a condition of excitement and suffering which is quite abnormal; and, in such instances, we may with some reason dread the occurrence of uterine rupture at a stage when we are comparatively powerless to avert it. The pains are almost continuous; and, if the parts are relaxed, the child may be forced through the passage with a rapidity which is almost appalling. In such instances, indeed, when the woman is taken unawares, the child may be born while she is yet in the erect posture, and dashed upon the floor.

Although, as we have seen, the usual effect of premature rupture of the membranes is to retard labor, the contact of the uterine walls with the surface of the child has occasionally the effect of rousing the organ to action of the most violent and uncontrollable kind, although the parts may as yet be but imperfectly prepared for the stage of expulsion. Emotional causes of various kinds may also have a similar effect in producing contractions of such energy as to bring the labor to a termination with unexpected rapidity. In some cases, the operation of these causes is obviously beneficial, and the mere threat of operative interference, or the production of the forceps, will sometimes have the effect of rousing the flagging energy of the expulsive forces, and bringing matters to a termination before operative measures have been resorted to. Scarlatina and other acute febrile disorders have in some instances a precisely similar effect.

In another class of cases, the rapidity of the labor seems to be due less to the violence of the pains than to the deficiency of the resistance to the passage of the child through the parturient canal. In the case of a pelvis of unusual size, this may take place, even although the pains are in no way beyond the average; and, of course, if such an anatomical condition as this is combined with violent uterine action, the rapidity

plan adopted. We should carefully avoid, therefore, digital examinations, beyond what may be considered absolutely necessary, and protect the patient from all sources of mental emotion or physical excitement, and from any other cause which experience has shown to exercise a decided influence upon the uterine fibre. On no account should the woman be allowed to assume or maintain the erect posture, which is well known to act as a fresh incentive to uterine action, by allowing the child to gravitate downwards and press against the os and cervix. Although, theoretically, we might naturally suppose that the ordinary abdominal bandage would rather encourage than abate uterine action, it has been found that it sometimes has a soothing effect, adding to the comfort of the patient, and in some degree relieving her suffering. Should this expedient be tried, it will be well so to adjust the bandage as to support the womb by pressure applied chiefly between the lumbar and hypogastric regions. When procidentia is threatened, it may be necessary to support the uterus by means of a bandage applied externally, and so adjusted as to press against the vulva. When the lower segment actually protrudes, a hole should be made in the bandage so as to aid the longitudinal fibres of the uterus in mechanically overcoming the resistance of the circular fibres and tissues of the os. In this way Naegele has operated successfully, allowing the child to be born actually through the aperture in the supporting bandage.

In cases of violent and precipitate labor, the fearful exertion to which the patient is impelled may culminate in an epileptic seizure, or even in apoplexy. In some cases the suffering is so great and so continuous, and the woman is worked up into such a state of frenzied excitement that, at the moment of delivery, she is actually unconscious of what she does. It is in consideration of this that the Continental codes look with leniency upon child murder perpetrated under such circumstances; and, probably, even in our own country, if such facts were substantiated, the law would take a similarly lenient view, although it is not set forth in the statute-book. Another question in medical jurisprudence, and which may have an important bearing in cases of suspected infanticide, is the likelihood of the mere rapidity of the birth being the cause of death of the child, as cases are recorded in which children have been born while the woman was in the erect posture, or even when she was at stool. It would appear, also, that sometimes, owing possibly to the great cerebral excitement, there is a greater tendency to the occurrence of puerperal mania, in women in whom the symptoms during labor have been of the nature of those above described.

dition to the dry toast, gruel, arrowroot, and sago, which are properly given at this stage, as being substances easy of digestion.

In the course of his subsequent visits, the accoucheur should see that the bandage is properly managed, and tightened from day to day ; and it is well, by firm and equable pressure, exercised over the hypogastric region,—which has often the effect of dislodging clots,—to be assured of the satisfactory state of the uterus as regards contraction. One of the first points to which he addresses his inquiries is with reference to the function of the bladder, which is sometimes resumed with difficulty. Laving with warm water will usually be all that is required to excite the bladder to contraction ; but, in some cases in which the labor has been difficult, the viscus is actually paralyzed, so as to require the use of the catheter, which may have to be repeated for several days.

If the bowels have been freely moved, as they should always be, shortly before delivery, we need pay no attention whatever to that function until forty-eight hours have elapsed. Torpor of the bowels is, after labor, an almost invariable condition, which is probably due, as Dr. Tyler Smith says, to “the exhaustion induced by labor in all the organs under the influence of the spinal cord.” Under the ordinary conditions of the puerperal state, it is, therefore necessary to give some laxative medicine,—of which class of remedies castor oil is undoubtedly the best. Other laxatives may, no doubt, act with equal efficiency ; but, as a rule, and especially in the form of pill, they are not to be depended upon. It is somewhat remarkable that, sluggish as the bowels are, they respond very readily to the action of laxatives, even in the case of those who are habitually costive. It will therefore rarely be found necessary to prescribe more than a dessertspoonful of castor oil, which may be given with lemon-juice early in the morning. On several occasions, we have seen an ordinary dose of half an ounce followed by such violent action as to require opiates to restrain the purging.

The Lochia.—While the placenta, during the third stage of labor, is being separated and expelled, a considerable amount of hemorrhage naturally takes place, and, after the completion of the process, blood continues to ooze from the ruptured and partially closed vessels on the inner surface of the womb. Efficient and rhythmical contraction of the uterus prevents the flow from becoming so profuse as to be dangerous ; but still, a certain amount of discharge goes on for a time ; and, indeed, it is well known that the maintenance of this discharge, for a certain time after delivery, is, to some extent, a guarantee of the favorable progress of the case, while, on the other hand, its premature arrestment is an almost invariable accompaniment of the more serious puerperal disorders, and is therefore always looked upon with more or less of apprehension. In order to understand the true nature of the lochial discharge, it is necessary to consider for a moment the anatomical condition of the parts from whence it springs.

That part of the uterus from which the placenta has been separated was compared by Harvey to the stump of a limb after amputation ; but, although the simile has been frequently repeated, physiologists are well aware that it is only to a limited extent correct. The vessels, no

great, it will be well to wash out the vagina by a warm-water injection containing a small quantity of carbolic acid. The discharge is also promoted by the acts of defecation and micturition, and by any change of posture; and it is a good practice, after the second day, and if nothing should occur to contraindicate such a procedure, to encourage the woman to make water on her knees, which permits of the escape of any portion of the fluid which may have become accumulated in the cavity of the vagina.

After-Pains are the natural accompaniments of the contractions which usually take place after labor, having for their object the expulsion of any clots that may be contained within the cavity of the uterus, and probably the expulsion of the clots which seal the vascular orifices. These after-pains are trifling or altogether absent in primiparæ, but are almost always present, in a greater or less degree, in women who have previously borne children. Up to a certain point they have a decidedly salutary effect, and contribute to the favorable progress of the case; but it not unfrequently happens, particularly in women who have had many children, that they are so severe as to cause much suffering and no little constitutional disturbance. Anything, in these cases, which tends to engender reflex uterine contraction will be pretty sure to aggravate the symptoms, so that vaginal examinations and irritation of the rectum and bladder should, as far as possible, be avoided or rectified. One of the most familiar causes of after-pains, so common as to have given rise to an aphorism among nurses, is the application of the child to the breast; and the accoucheur should generally avail himself of this well-known fact to insure thorough and efficient uterine contraction. And we may here repeat what was stated on a previous occasion, that nothing, perhaps, tends so much to insure that the after-pains shall be moderate in degree as gentle pressure on the fundus, and careful attention to the contraction of the uterus during and after the expulsion of the placenta.

The after-pains usually commence soon after labor, and in bad cases they last for three or four days. In other cases, again, they are at first moderate, and after some time come on with great violence. If there be any suspicion of retained coagula, it will be proper to pass the finger into the vagina, and remove any clots which may be within reach. Should no such cause be discernible, and the pains still persist, the application of a warm poultice over the hypogaster, or a soothing injection into the vagina, will often suffice to allay the suffering, if not to cause perfect relief. In France, an ointment containing belladonna has been extensively used, and no doubt may be productive of benefit; but the objections to the general use of this drug have already been stated. In some instances the pains are distinctly neuralgic, or are associated with a rheumatic condition of the uterus; and in these, as well as in all other cases in which the sufferings of the woman go beyond a certain point, and especially when they prevent sleep, opium may be given without hesitation, either by the mouth or by enema. It is well, however, before giving opium in any form, to be sure that there is no irritation of the bowel from overdistension or any other cause, as it will be proper to relieve that condition before having recourse to

more violent action which is apt to culminate in abscess. No small amount of suffering arises in some instances from the weight of the inflamed gland, which gives rise to dragging, and aggravation of all the symptoms. This condition can fortunately be greatly relieved by the simple expedient of suspending the breast by means of a handkerchief slung round the neck.

It is a very usual thing for nurses to put the child frequently to the breast, with the view of relieving such symptoms as are here described. This, however, should always be done with caution, and in view of the whole circumstances of the case. For, it must be remembered that this effect of the contact of the child is not only to empty the breasts but also to stimulate them to increased secretion, and if this latter effect—as it well may be—is in excess of the former, the treatment is obviously injudicious, and is likely either to precipitate the direct effects of inflammation, or to induce an excessive secretion of milk, which in most women has a serious effect upon the general health. Besides, the too frequent contact of the child is apt to cause certain painful affections of the nipple, to which we shall afterwards advert, and is by no means free from risk to the child itself.

The *Colostrum*, or milk first secreted, is somewhat irritant, and thus has a satisfactory effect in removing, by its laxative action, what remains of meconium in the bowels, and in preparing the mucous membrane of the alimentary canal for its functions of assimilation and excretion; but the too frequent ingestion of this, or even of perfectly developed milk, is apt to keep up a continuous digestive action in the stomach, and give that viscus no time to rest; and even when the child sucks vigorously, the repeated overdistension of the stomach only results in rejection again and again of what has been swallowed. The mother ought, if possible, on each occasion, to put the child to both breasts, as the emptying of one, and leaving the other in a state of complete distension, as is sometimes done, is not likely to contribute much to her comfort. It is always better partly to empty both breasts than wholly to empty one.

It is therefore of great importance that the mother should be warned from the first not to put the child too frequently to the breast. If the child sleeps by her side this is the ready method of cure for restlessness and screaming fits, and the child is often allowed to fall asleep with the nipple in its mouth; but, if it once contracts this habit, it may become impossible for it to be put to sleep in any other position, while it drinks at intervals without the consciousness of the mother. This, of course, an experienced nurse will never permit, but it is a matter of greater difficulty to determine what is sufficient nourishment for an infant, and at what intervals it should be given. This would perhaps fall more properly to be considered in the following chapter, but as it involves the interests of the mother as well as those of the child, we may here observe that it is of much importance to accustom the child from the first to drink at regular intervals. These, to begin with, may be every two hours, or if the child be premature or feeble, and on that account able only to take a small quantity of nourishment at a time, it will be necessary to put it to the breast at shorter intervals. But

the object of the mother should always be to increase the interval until, after the second or third week, the infant becomes accustomed to take its natural nourishment every three or even four hours. This enables the mother to have her natural rest, and allows of the steady and satisfactory filling of the breasts against the stated periods.

It often happens, in women too who have an abundant supply of milk, that much disappointment results from the frequent escape, and consequent waste of the secretion. A certain amount of overflow, just at the commencement, when the breasts are tumid and distended, is so far beneficial; but when this goes on,—independent, it may be, of the amount of the secretion—it comes to be a serious matter, and may give rise to no little perplexity and annoyance. The milk which thus runs from the breasts may keep the woman in a constant state of moisture and discomfort, and although it is possible to collect the fluid discharged in small vessels which are used for the purpose, and even to give it to the child by a spoon, this is always an unfortunate occurrence. It often happens that, by careful attention to the period at which the child should be put to the breast, on the one hand guarding against over-distension, and on the other avoiding frequent and irregular applications of the child, much may be done to prevent this loss. In some cases, when the glands reach a certain stage of distension, the woman is conscious of a feeling of momentary discomfort, and then of involuntary contraction, immediately after which the greater part of the accumulated secretion is expelled, not unfrequently in jets. In other instances, this spasmodic contraction is excited by the contact of the child, when both breasts are simultaneously the seat of contraction, so that while the infant is half choked with the milk of one breast, that of the other is expelled in jets as before. In another class of cases, the application of the child is attended with acute pain in the breast of a neuralgic character, sometimes, indeed, so severe as to cause the woman to cease nursing. Emollient and sedative applications, such as belladonna, have been employed, with the view of soothing this painful affection; but in some cases it defies both these and internal remedies, and ultimately compels the woman to yield.

Every conceivable shade of difference is found to exist between different women, even of the same constitution and temperament, in the quantity of the lacteal secretion, and also in regard to its quality. In one case, we find a delicate, fragile woman, who may even be the subject of constitutional disease, and who is, nevertheless, overburdened with milk; while, in the next which comes under our notice, a young, robust, and vigorous woman, who has never had an hour's illness, fails completely in so far as the lacteal function is concerned. We do not, of course, mean to imply that such are common cases, but they are certainly not such as would cause the experienced practitioner a moment's astonishment. The commencement of lactation may, in like manner, be ushered in with all the usual symptoms, and be at first abundant, only to fail in a few days; while, in another, the secretion is ultimately satisfactorily established after a period of doubt and difficulty. Although, therefore, we know that strong and healthy women are more likely to prove good nurses, we can never be certain, until a

week, or even longer, has passed, how the case, in this respect, is likely to turn out. There is no doubt that, although there are other conditions which influence the secretion of the milk, the state of the uterus, and the natural sequence of events of which it is the seat, exercise an important influence, owing to the well-known sympathy which subsists between the organs.

In the condition which has been termed *Agalactia*, the secretion is either altogether arrested, or is manifestly insufficient in quantity for the nourishment of the infant. Among the most frequent causes which lead to this condition are acute diseases, more especially if they immediately succeed the period of delivery. It is, in fact, one of the most common symptoms of those febrile diseases which sometimes supervene on the puerperal state, to the alarm of the attendants, and not seldom with the most disastrous results; and the failure of the secretion is always looked upon as of more serious import, if it is accompanied by the premature cessation of the lochia. But, independent of any other marked or serious symptom, there is sometimes a simple failure of the discharge, where it is difficult or impossible to recognize the cause.

We are not, however, to suppose that such failure is conclusive evidence of permanent incapacity, on the part of the woman, to discharge this natural function. If due to a febrile condition of moderate duration, the discharge will often reappear with the abatement of the pyrexial symptoms; so that, by feeding the infant artificially for a time, we may wait until we see whether or not the function will be re-established. This will be furthered by the application of warm fomentations to the breasts, and of late years the leaves of the castor-oil plant have been extensively used as a local application with the view of increasing or exciting the secretion. For this purpose the leaves are to be boiled in a small quantity of water and are to be applied along with the water in which they have been infused, in the form of a fomentation.

The quantity of the lacteal secretion is, under no circumstances, to be accepted as a criterion of its quality. The eye enables us, in some measure, to judge of the abundance of the corpuscular elements upon which the nutritive value of the secretion mainly depends. This may, however, be more accurately ascertained by means of a lactometer, or by the use of the microscope; but it is to be remembered that the richest milk is by no means that which is necessarily best suited for the child.

Galactorrhœa, or a too abundant secretion of milk, has been described under two forms, involving very different conditions and management. In the one, the quantity alone is abnormal, the nutritive value of the secretion being unaffected, so that our object in treatment would naturally be to guard against such an unnecessary drain upon the mother, as might be expected ultimately to compromise her general health. In this variety, the effect produced upon the child may be perfectly satisfactory, the only inconvenience, in many cases, being from the rapidity and abundance of the flow from the reservoirs within the gland, so that the mouth of the child fills much more rapidly than it can swallow, to its great and obvious discomfort. The treatment of such a case should

consist mainly, if not entirely, in regulation of the diet, watching narrowly the while what effect is being produced upon the health of the mother, and adopting such means as may seem necessary for its rectification, by the partial arrestment of the discharge or otherwise.

In the other variety of galactorrhœa, the conditions are widely different. Here, too, there is abnormal abundance; but, in addition, we find that the increase in bulk depends mainly or entirely upon an augmentation of the watery part of the fluid. Not only is this a state of matters extremely unfavorable to the infant, but it is often observed to exercise an unsatisfactory influence upon the mother. Indeed, in extreme cases, so serious and so obvious are the effects thus produced, that the expression "Mammary Diabetes" has been suggested by the rapid emaciation which occasionally supervenes. Along with great feebleness, there unfortunately exists sometimes, in these cases, complete loss of appetite, so that it is almost impossible to combat the symptoms by what we might judge to be appropriate diet. When the anorexia is less marked, the digestive functions may be disturbed,—gastric and intestinal disorders being of frequent occurrence, taking the form, it may be, either of vomiting with heartburn and pyrosis, or of obstinate diarrhœa with flatulent distension and tenesmus. In those cases, ordinary remedies may prove of little avail, and after a few weeks of struggle it will become evident that no alternative remains except to wean the child, and take such other measures as may permanently arrest the secretion. This affection is believed to be particularly dangerous to those who have any phthisical tendency.

From what has been said, it will be sufficiently obvious that the Management of Lactation must not unfrequently be a prominent part of the duties of the accoucheur. Nothing, in this respect, is more important than that the diet of a nursing woman should be, in quantity and in quality, such as is most likely to conduce to the health of the child, as well as to her own. In the case of a perfectly healthy woman, but little attention to regimen is required,—nothing further being necessary, in such instances, than that the woman should avoid any imprudence in diet, while in other respects she need make no change in her ordinary habits. The pregnant state, however, and the subsequent exhaustion which attends the process of parturition, very generally leave the woman in a condition which manifestly requires generous treatment, in order that the health may be re-established, while provision is made for the special drain on the system which the function of lactation involves. Among the higher classes, where luxurious habits tend to the diminution of constitutional vigor, and among the inhabitants of towns, the necessity for such treatment is much more prominently marked than in country districts, where a life of physical exertion, spent, to a great extent, in the open air, implies hygienic conditions which are the very opposite of those which we observe in the other case. In ordinary practice, however, the necessity for a liberal dietary is so universally recognized that there is a danger of falling into a routine practice in this respect, the result of which will, undoubtedly, in some cases, be the reverse of beneficial.

As the results of some experience and close observation, we are con-

vinced that indiscriminate overfeeding and stimulation of nursing women is a more frequent cause of the disorders of early infancy than is usually supposed. Nurses and mothers can readily understand how a thin and watery milk should fail to nourish the child, but it is by no means so easy to convince them that a specimen rich in nutritious elements may possibly be, from its very richness, the cause why an infant does not thrive. We have again and again seen cases of obstinate diarrhoea, with or without vomiting and other symptoms of gastrointestinal derangement, which could only be attributed to this cause. Drugs are of no avail; the appearance of the mother may be such as to prevent even a suspicion of any fault on her side, and yet strict inquiry as to what she eats and drinks often points clearly to the simple and only proper treatment. It is to the use of stimulants that the attention should in these cases be more particularly directed; for we often find that women are encouraged, without any reference whatever to their general health, or the state of the milk, to take considerable quantities of ale or stout, or of the stronger wines. Diminishing the quantity of these stimulants, and in some cases absolutely forbidding their use, will certainly, in many instances, be followed by a marked and immediate amelioration in the symptoms. But, even when stimulants are not admitted into the dietary, the cause may still be discovered in the habitual use of food which is too stimulating in its character, or which is given in too great quantity.

An interesting series of observations, bearing directly on this subject, have been deduced from analyses conducted by M. Pélégot, with the view of ascertaining the nutritive value of the lacteal secretion at various epochs. From these analyses it would appear that the longer the milk remains in the breast, the thinner and more aqueous does it become. It has been clearly established, further, that the milk which first flows from a distended breast—this being the portion soonest secreted—is comparatively watery, and that the quality of the milk becomes richer as the gland is progressively emptied. Hence a very obvious indication of treatment. When, for example, the child seems to be suffering from too rich milk, and there is reason to suppose that it is put too frequently to the breast, before the gland has time to fill, it may suffice to extend the period between the repasts, which, by giving the gland time to fill, also insures that the child obtains a less rich milk, and one more suited to its digestive capabilities. And we believe that the same facts may possibly be turned to account in the treatment of the opposite class of cases, where the secretion is too watery, and yet abundant, by partially emptying the breast before the child is put to it, so that, the more watery portion of the milk being removed, the child obtains the more nutritious residue.

The duration of lactation varies very considerably. It may cease quite unexpectedly, a few weeks, or even days, after the secretion has been established, or it may last for years. Between these two extremes the range is obviously great; but, as a rule, in cases in which the whole circumstances are perfectly normal, the average duration may be set down as from twelve to fifteen months. This is, of course, supposing that the woman goes on nursing, and that nothing is done with

the view of interrupting the function. The influence which is produced upon lactation by the menstrual function, is a subject in regard to which very vague ideas are sometimes entertained. As a rule, a woman does not menstruate while she continues to nurse, so that no disturbing influence from this source normally exists. In a very considerable number of instances, however, she menstruates after five or six months; and, in a small proportion of cases, the menstrual function is regularly discharged during the whole period that she gives suck. Much discussion has taken place as to the influence which the constitutional disturbance inseparable from the menstrual molimen exercises on the process of lactation; and the question is often put to the medical attendant, whether the appearance of the catamenia is a sufficient reason for ceasing to nurse. It is beyond doubt that, in a large number (probably the majority) of cases in which menstruation occurs during lactation, no perceptible effect is produced upon the child. It is equally true, however, that marked disturbance of the one function attends the premature establishment of the other, as is evidenced by the most delicate of all tests,—disturbance of the functions of the child, which in some cases is very marked, and recurs at successive menstrual epochs. We must not, therefore, in replying to the question stated above, rashly assume, either that menstruation forbids nursing, or that it is to be disregarded. The truth lies between the two, and the solution of the question is to be found in a careful observation of the effects which are produced on the mother and child; upon which alone a definite opinion can be formed.

It sometimes happens that a woman becomes pregnant while she is still nursing, although the rule is that, during lactation, the generative functions are in abeyance, in so far, at least, as ovulation is concerned. In the exceptional instances referred to, it is not too much to suppose that, the whole generative force being diverted into a new channel, the nursing power must necessarily diminish; and that this is actually the case, is the experience of all who have watched these phenomena most closely. During the first weeks of such a pregnancy, the lactation may be but little disturbed, although there is good reason to believe that a failure in the amount of the milk, or an alteration in its quality, precedes, not unfrequently, the period at which the woman becomes conscious of her state. On the whole, we do not hesitate to assert that the existence of pregnancy is a clear indication that the woman should cease to nurse.

The important function of lactation is liable to certain disorders, or disturbing influences, the management of which comes necessarily under the duties of the medical attendant. The most familiar of these is, undoubtedly, Inflammation of the Mamma, and, when we consider the sudden determination of blood, and consequent turgescence of the gland, our feeling may be one of astonishment, not that it often inflames, but rather that it, as a rule, escapes inflammation. From whatever cause it may spring, the condition of the gland during the puerperal state must manifestly be such as to favor the extension of inflammatory action which has arisen within the structure. Exposure to cold, the irritation of sore nipples, and constitutional disturbance of various kinds,

are a few, among many causes leading to local inflammation, which almost invariably attacks, in the first instance, the tubular structure of the gland. But a mere local affection of an external organ of limited extent, would probably be looked upon with little alarm, were it not for the fact that there here exists a peculiar liability to the formation of pus, resulting only too frequently in the formation of *Mammary Abscess*.

It is said that women of a weakly, delicate, or scrofulous constitution are peculiarly liable to mammary abscess; but whether this be the case or not, there are many cases in which, in women of perfect health and vigorous constitution, this troublesome affection quite unexpectedly manifests itself. There is, certainly, a great tendency to its reappearance in those who have suffered on a former occasion; but beyond this there is no marked predisposition upon which we can rely. The inflammation which precedes the formation of abscess is, if it be at all severe, ushered in by rigors, which are often of considerable severity. This is immediately followed by fever, and very shortly by lancinating pain in the breast, which is increased on pressure. The site of the pain, usually circumscribed, is further indicated by the presence of swelling and hardness, which, in favorable cases, become gradually resolved as the inflammation subsides, without the formation of pus.

But when abscess forms, the progress of the case is widely different. The inflammatory action, commencing, as we have seen, in the glandular structure, extends to the cellular tissue. The tumor, hard before, becomes less circumscribed and softer, although no less painful. The general symptoms are unabated; and, as the swelling still further increases, the cutaneous surface becomes hot and red, and ultimately œdematous, and glazed or shining. The latter symptoms indicate the formation of pus, the presence of which is still more clearly manifested by the feeling of fluctuation, which becomes more and more distinct as the cavity enlarges, and the pus approaches the surface. With the formation of matter there may be a renewal of the rigors, and there is generally painful throbbing and exacerbation of the fever. Finally the cutaneous tissues yield, and the abscess bursts, discharging its contents, to the great relief of the patient. Unfortunately, however, her troubles do not always cease here; for, under the influence of a protracted drain on the system, she may be reduced to a condition of deplorable weakness, which may be aggravated by obstinate gastric or intestinal derangement, or by profuse night-sweats. The cases which are, in the first instance, the most severe, are not necessarily those which ultimately produce the most serious effect upon the patient. It is true that the symptoms are, at first, in proportion to the violence of the inflammation and the extent of the abscess. But, on the other hand, the violence of the attack is often, under such circumstances, apparently expended; and, unless the discharge is abnormally protracted, the gland may gradually resume its healthy condition and normal function, while the constitutional symptoms rapidly disappear.

In another class of cases the symptoms at the outset are comparatively moderate, and the abscess correspondingly small. When the latter discharges itself, or is relieved by operation, the cavity contracts, and we imagine that the case is at an end. But ere long the former

symptoms reappear, a second abscess forms, runs its course, and discharges its contents as before; and in some cases a succession of such local inflammations, individually of limited extent, may produce, collectively, such effects as more seriously to influence the health than a case which may at first have excited more apprehension in our minds. In those cases of repeated small abscesses, there is often extensive induration, which may affect the whole, or the greater part of the gland, especially that part of it immediately surrounding the nipple.

The result of severe inflammation of the mamma, whether the abscess be single or multiple, usually is to destroy the nursing function of the gland. It is not that the secerning function of the gland is necessarily, or even generally, arrested; but rather that the application of the child is attended with such pain and irritation that it is at once impossible and undesirable. If the matter has been allowed to make its way to the surface, it often happens that a certain amount of sloughing occurs of the tissues surrounding and immediately subjacent to the orifice. By the same process the continuity of the galactophorous tubes is also occasionally destroyed, and, as a consequence, a lacteal fistula is established. The continued secretion of milk in the unaffected portions of the gland is sometimes a serious obstacle, in this and other ways, to the satisfactory issue of the case; so that it is proper, in many instances, by friction or the external application of belladonna, to do what we can to arrest permanently the function of the mamma on the affected side. It sometimes happens that, by sympathy or otherwise, the other gland becomes similarly affected by inflammation and abscess, which, of course, makes the case a much more serious one.

The treatment of inflammation of the mamma is thus, it need scarcely be observed, a matter of the highest importance. The initiatory phenomena of inflammation are to be combated by a careful management of the secretion, which should not be permitted to accumulate within the gland. This is, however, a matter of considerable difficulty; for, while the application of the child, or the breast-pump, is often productive of irritation, rubbing of the breasts, which is the other alternative, is apt to increase it also. Cold or evaporating lotions are not to be depended upon; so that we are often obliged at once to have recourse to leeches, fomentations, and poultices, just as we would in the case of the inflammation of any other gland.

Should all our endeavors fail—as, unfortunately, they often will do—to arrest the inflammation, the earliest indications of the formation of pus are to be earnestly looked for. So soon as fluctuation can be detected, however faintly, the case may, we believe, often be cut short by early puncture, by means of an exploratory trocar or needle, which, by giving vent even to a few drops of pus, relieves tension, and often, apparently, arrests the course of the disease. Where fluctuation is already distinct, and near the surface, free incision should be practiced, on ordinary surgical principles, in the most depending part, so as to give immediate egress to the pus which has formed, making the opening—in order to avoid the lacteal tubes—in a direction radiating from the nipple. Both before and after the operation, great comfort is afforded to the woman by suspending the breast, by means of a hand-

kerchief tied round the neck. In the case of a large abscess, the contraction of the cavity may be promoted by the application, externally, of broad strips of sticking-plaster, so adjusted as to contract the cavity within which the matter lies. In other respects, the affection is to be treated as an ordinary surgical lesion, while the general health must, of course, be carefully attended to. Whenever much trouble is encountered in the treatment of mammary abscess, we should not delay in ordering the removal of the child from the breast.

Excoriation and Fissure of the Nipple are affections so common, and withal so troublesome and painful, that their treatment should be a matter of interest to every careful and judicious practitioner. Although in themselves they are comparatively of little moment, they are of peculiar importance as causes of the more serious affections which we have just been considering. Much may, undoubtedly, be done in the way of prevention. Women, among the higher classes especially, should be instructed to lave the nipple, for many weeks before delivery, with some mild astringent or stimulant lotion, such as a weak solution of tannin in rose-water, or any dilute spirit. When, however, excoriation has already taken place, the nurse should be instructed to apply some very gentle astringent at first,—nothing being better than a strong infusion of tea. Failing this, the applications above recommended for prevention may be tried, or other similar medicaments,—of which there is an endless variety,—may be adopted. Care must, however, be taken to avoid such substances as may be prejudicial to the child,—such as acetate of lead; and in all cases the application should be washed off very gently before the infant is put to the breast. In the more obstinate cases, the following will be found an admirable substitute:

R. Acid. Tannici,	.	.	.	.	.	gr. iij.
Glycerin,	.	.	.	.	.	ʒss.
Unguent. Cetaceæ, ad	.	.	.	.	.	ʒj.

Sig. To be used as directed.

Fissures or chaps are even more troublesome than excoriation; for, although they may at first be but trifling, every application of the child tends to tear them open, and undo the healing process of the interval. The above, or any similar ointment, will here also be found of great use, the best method of application being to introduce it into the chap by means of scraped lint. Should the margin of the fissure become callous, it may be necessary to apply freely the solid nitrate of silver. The nipple-guard, or shield, is, in all cases, useful in protecting the affected parts from the pressure of the dress; and, when much pain is experienced in the act of suckling, the artificial nipple should be employed, which will protect the parts from the violence to which they are often subjected by the vigorous sucking of a healthy child. In some obstinate cases, the irritation is such that it may ultimately be found necessary to remove the child permanently from the breast, and to obtain the services of a hired nurse.

CHAPTER XXXIX.

THE NEWLY BORN CHILD.

MANAGEMENT OF THE CORD—CLOTHING—CLEANLINESS—LIGHT AND AIR—COLOSTRUM: IMPROPER USE OF LAXATIVES—THE MOTHER TO NURSE IF POSSIBLE—SELECTION OF HIRED NURSES; THEIR DIET AND REGIMEN—CAUSES OF DIFFICULTY IN SUCKING—CONGENITAL MALFORMATIONS—THE EXCRETORY FUNCTIONS—DIARRHŒA: SIMPLE OR “CATARRHAL,” AND INFLAMMATORY OR “DYSENTERIC” VARIETIES: TREATMENT OF EACH—CONSTIPATION: MANAGEMENT OF—ICTERUS NEONATORUM—THRUSH—ARTIFICIAL FEEDING: SUBSTITUTES FOR BREAST MILK: COW’S MILK, DILUTED AND SWEETENED; NURSING-BOTTLES: NURSE TO BE PROCURED IF CHILD DOES NOT THRIVE: OTHER ARTICLES OF DIET: LIEBIG’S FOOD FOR INFANTS—WEANING—DENTITION.

THE subject of this chapter has reference to certain points relative to the management of the infant after its birth, and the treatment of some of the more common ailments which are apt to attack it during the first weeks or months of its existence.

So soon as the nurse has, after the termination of labor, attended to those matters of detail which are essential to the comfort and safety of the mother, her attention is naturally turned to the child, which is then to be washed and dressed. The first point to be looked to, after it has been thoroughly cleansed by soap and warm water, is the stump of the cord, which undergoes a process of putrefaction, and, ultimately, in the course of a few days, separates at the cutaneous margin of the umbilicus. The decomposition of the tissues of the cord takes the form rather of withering than of moist putrefaction; but before it drops off, there is generally more or less of the odor characteristic of the process which is going on. To obviate this, it has long been the practice to wrap the cord in cotton or linen, passing the stump, in the first instance, through a hole which has been *burnt* in the fabric, so as to secure the antiseptic action of the charred margin. This, of course, is not essential, but is, undoubtedly, favorable to cleanliness; and the dressing may be renewed at proper intervals, to be determined by the amount of moisture which makes its appearance, and which will depend, in a great measure on the thickness of the cord. For some time after the separation is complete, there remains a tendency, more or less marked, to the formation of umbilical hernia. This is particularly noticeable in the case of children who are subject to screaming fits and to the straining which accompanies them; and is in all cases to be guarded against by the application over the umbilicus of a soft pad, formed by several folds of linen, which is retained in position by a broad bandage of flannel with which the abdomen of the child is swathed. By increase in the thickness or otherwise, the pad may be so modified, in cases in

which protrusion is threatened, as to retain the bowel within the abdominal cavity.

The clothing of the child is in some measure to be regulated with reference to season and climate. In all cases, however, it is to be remembered that birth almost necessarily involves a sudden and considerable diminution of temperature. Any failure, therefore, in the vigor of the circulation, such as may be anticipated in premature delivery, is very likely to be attended with a corresponding diminution in the temperature of the body, which not unfrequently involves great and sudden risk to the life of the child. The maintenance, therefore, at first, of an equable temperature is of the highest importance, and is universally recognized. On these grounds, flannel—which, as a bad conductor of heat, tends materially to sustain a steady temperature—is, to a great extent, employed in the clothing of infants. It has also the advantage of absorbing the discharges to some extent, and thus preventing any irritation which may arise from their prolonged contact with the cutaneous surface. While the infant is thus wrapped in its swaddling-clothes, care should be taken so to arrange them as to admit of free movement of the limbs from the first. It was at one time supposed that the head of the child should be protected as carefully as its trunk; but the general practice now is rather to keep the head cool, so that, in this country at least, it is the exception rather than the rule, to put even a light cap on the head of a child. Important as the maintenance of an equable temperature is in all cases, it is much more so when the infant is brought prematurely into the world,—when it is necessary, in order to maintain the circulation, to swathe the limbs in cotton-wool, at least during the first few weeks after birth. In all cases, for the first few months, the heat of the trunk and lower limbs is further insured by the use of long clothes.

Strict cleanliness is essential to the well-being of the infant; and in nothing is the difference between a good and a careless nurse more clearly evidenced than by the management of the napkins, and the protection of the parts from the contact of urinary and fecal discharges. Neglect here frequently gives rise to troublesome excoriation of the nates, or in the flexure of the groins; and nothing, perhaps, is of more importance than that the child should be kept dry as well as clean. The use of the warm bath is universal; but, as regards the frequency with which it is to be employed, some degree of discretion may be exercised in individual cases. Many nurses, after the first few days, undress and bathe the infant, if perfectly healthy, night and morning, and apparently with benefit as well as with safety. Caution should, however, in this respect, always be enjoined, as, in some instances, too frequent bathing seems to produce an exhausting effect; and, in the case of feeble or sick children, it may only be possible to insure cleanliness by rapid sponging, while the bath is either avoided altogether, or repeated only at intervals of two or three days. During the first six weeks, the child should not be permitted to remain in the bath for more than four or five minutes.

Light and air are as essential to the growth of a child as to that of a plant. At first, however, caution is, even in these respects, necessary.

A dim and subdued light is thus most suitable, until the organs of vision become, in some degree, accustomed to the new stimulus; and, in like manner, until the new function of respiration, and the maintenance of temperature, are efficiently and vigorously discharged, we must take care, in our anxiety for pure air, not to expose the infant to vicissitudes of temperature. In the warm weather of summer it may be taken out somewhat earlier, although, as a rule, it is better not to carry the child out of doors before the end of the second week; but, when this stage has been reached, nothing, perhaps, is of greater importance, or has a greater effect on the health and development of the infant, than its daily exposure in the open air, clothed according to the requirements of the season.

During the weeks which immediately succeed its birth, the infant passes the greater portion of its time, by day as well as by night, in sleep; but in this respect there is great variety, even with healthy children. For example, it often happens that they sleep quietly and almost continuously during the day, awakening only at intervals to go to the breast, while at night they are wakeful and restless. This, after a time, is often rectified by the management of an intelligent nurse, who, by keeping the child awake during a part of the day, or it may be by bathing it at night instead of the morning, succeeds in breaking the habit, to the great relief and comfort of the mother, who otherwise has her rest broken and her nursing powers impaired. Sleep is certainly encouraged, and often very markedly so, by the daily exposure to the open air.

The child should, for various reasons—some of which have been previously mentioned—be put early to the breast. The laxative action of the *Colostrum* generally produces the discharge from the bowels of the dark-colored meconium which is lodged there. It is too much the habit of nurses to dose the infant with castor oil, under the idea that it is necessary in order to set up the excretory function of the bowels. The practice is no less deleterious in its results than it is irrational in theory; and, in point of fact, there is no more fruitful cause of subsequent gastric irritation and intestinal derangement. The accoucheur should therefore put his absolute veto on any such treatment without his sanction, at least during the period while he remains in attendance. It is no doubt more frequently necessary when the child is being nourished with substitutes for breast-milk, but in a great majority of cases, it is, to say the least, perfectly unnecessary. Another very general practice is, during the first two days, before the secretion of milk has been thoroughly established, to feed the child with sugar and water. The effect of this, too, is often the reverse of beneficial, as this syrup is not only unsuitable to the nourishment of a newly-born child, but it is also apt to derange the functions and to give rise to ulterior ailments, which may be the cause both of trouble and anxiety. A mixture of cow's milk and water, with a very small proportion of sugar,—or, better still, of sugar of milk,—is a more eligible substitute; but so soon as the milk becomes abundant, all such methods should be abandoned for the natural secretion of the mother's breast.

Every mother should be encouraged to nurse her own offspring,

unless under certain exceptional conditions, which have been referred to in the preceding chapter. For not only is this to her advantage ultimately, by preventing too frequent pregnancies, but it is to the advantage of the child, by furnishing it with what nature has specially provided for its support. What has already been said with reference to the function of lactation, is sufficient clearly to show how important is the management of that function, in its bearing upon the child, no less than upon the mother. Care should be taken from the beginning to put the child to the breast at something like fixed intervals,—which at first may be two hours, but which should afterwards be extended to three, or even four hours. This, by allowing the breasts to fill, and permitting the mother satisfactory and continuous sleep, goes some way to maintain the quality of the milk; while, as regards the child, it gives the digestive and assimilative functions time to rest. There is certainly no more fertile cause of the minor digestive derangements, than the habits which prevail among the ignorant, of constantly putting the infant to the breast, as the ready method of cure for restlessness or screaming fits.

Various circumstances,—sometimes occurring quite unexpectedly,—may render it impossible that the mother can nurse her infant. When this is the case, the medical attendant should always recommend that the services of a hired nurse be at once obtained; and if this recommendation be acted upon, the duty of selecting a nurse devolves naturally upon him. This is a matter of no small importance. From what has been said in the preceding chapter as to the nutritive value of the milk in different cases, it will be obvious that some caution must be exercised, and especially that we should not too hurriedly infer, either from the abundance or the apparent richness of the milk, that the woman is to be looked upon with confidence, as necessarily a good nurse. There are certain other matters in regard to which it is our duty to inquire. We thus look narrowly, and as a matter of course, to the general health, circumstances, and age of the applicant; a perfectly healthy young woman, from a country district, and between the ages of eighteen and twenty-eight, being generally preferred. With reference to general health, some have attached considerable importance to the state of the teeth, as affording a reliable indication; and, although this has certainly been exaggerated, there can be no doubt that the early loss of the teeth, and especially of the front teeth, by decay, is so far an unfavorable symptom. It is obviously our duty to determine, in so far as this may be possible, whether she is the subject of any disease which may be transmissible to the child. Any evidence, should it but amount to a suspicion, of serious organic disease, and especially of a phthisical tendency, may be held to warrant rejection. Unfortunately, the circumstances are such, in many cases, as to admit of, at least, the possibility of a syphilitic taint, and this is, therefore, a point in regard to which we should very specially be on our guard. To glance at the throat, the skin, the glands of the neck, and the hair, are, on this account, matters almost of routine in such investigations. We should also examine the breasts,—not only with regard to their secretion, but as to the state of the nipple; and the presence of severe

and sucks vigorously, and indeed has often been seen to suck the finger of the accoucheur before the trunk was born. It is not, however, always so. The difficulty arises, in many cases, from a peculiarity in the conformation of the nipple, which may either be unusually small, or—what is more common—has been carelessly allowed to be pressed in by the dress during pregnancy. This may generally be got over by having the nipple drawn out by the nurse or by a strong child, by the breast-pump, or by a soda-water bottle used like a cupping-glass, care being taken not to permit the parts to relapse into their former condition. With care and proper management on the part of the nurse, this difficulty is seldom a serious one. The child may, in other cases, especially when born prematurely, be unable by weakness to take the breast, a condition which is highly unsatisfactory. The woman, in these cases, should milk her breast into the mouth of the child, when it will generally swallow the milk as it flows; or she may drain it off by the pump, and feed the infant by a spoon; but the objection to this is that it is a bad plan to use a spoon if it can be avoided, for the child thus becomes accustomed to the spoon, and still further loses the instinct for the nipple. An idea extensively prevails among the lower classes that when a child has difficulty in sucking or refuses the breast, it is “tongue-tied,” but this is an obvious error. It, no doubt, does happen, although very rarely, that the frænum of the tongue is too short, or attached too far forward, but in ordinary practice it will probably not occur oftener than once in a lifetime that the accoucheur is obliged to divide the frænum for this variety of congenital malformation.

It is the duty of the accoucheur to examine the child after its birth, and to inquire on his subsequent visits as to the various functions, in order that congenital malformations may not be overlooked. It may thus become evident either immediately or shortly after birth that the child is affected with some peculiarity which must be remedied in order to save its life. Such malformations as harelip fall more properly into the domain of surgery, but in the case of an imperforate condition of the anus or urethra, the general practitioner must be prepared to act promptly. In the former, an operation is necessary by incision in the direction of the rectum, or it may even be necessary in extreme cases to form an artificial anus. Imperforate urethra, again, is rare, probably for the reason which is pointed out by Burns, that “generally the canal opens, in supposed cases of imperforation, about midway between the scrotum and glans penis;” and the result of experience seems to be that perforation of the glans seldom succeeds, so that it would probably be better to cut down upon the urethra than attempt to find its extremity. It may be necessary, even where there is no closure, to pass a probe or a very small elastic catheter into the bladder in consequence of retention.

We are often told, a considerable time after delivery, that the child has not made water. On such information, however, we must never act; unless there is some evidence of distension of the bladder. The urine is often voided in the bath, and thus escapes the notice of the nurse, and if retained for a longer period than usual, the application of cold water over the hypogaster, or a teaspoonful of cold water given by

be inquired into, and, if necessary, modified without delay. Should the presence of blood in the stools, an appearance of tenesmus, and general inflammatory symptoms, indicate the existence of the more serious form, nothing has a better effect, if it can be retained, than castor oil with a single drop of laudanum. Among other available astringents are the tinctures of catechu or kino, which may be administered in the usual way with chalk mixture, to which may be added, in the event of flatulence being a concomitant symptom, a proper proportion of peppermint or pennyroyal water. The young practitioner cannot be too cautious in the use of opium in any of its forms; for, although he may thus succeed in checking the discharge, the benefit which results is often temporary in its character, and, indeed, the symptoms would sometimes seem to come on after opium worse than before. The bright green appearance of the evacuations, to which reference has already been made, is not to be looked upon as necessarily a very unfavorable condition; and one object in mentioning the fact at this place is that this condition seems somewhat too frequently to be admitted as a reason for the administration of powerful drugs. When, at a somewhat more advanced age, the child is being fed, an alteration in its diet and a recurrence to the simpler nourishment of the earlier months will often suffice to arrest the symptoms.

In the case of habitual *Constipation*, a favorite remedy is mauna given with milk. Nothing is easier, of course, than to move the bowels, either by this, by castor oil, or by any other laxative; but it will generally be found that if we begin with laxatives, they must be continued. On this account, many nurses prefer to use an injection of soap—or to pass into the rectum a small piece of soap, which is cut so as to admit of its easy introduction. We cannot doubt, however, that a large proportion of such cases are unnecessarily treated, and would do quite well if left alone.

It is only possible for us very briefly to notice a few of the more common ailments which affect the infant shortly after its birth. The vulgar nomenclature of these disorders has unfortunately shrouded the subject with an obscurity, which the limited knowledge of most midwives rather tends to deepen. Such terms as “hives” and “gum” are familiar in the mouths of experienced matrons of the lower class; but, unfortunately, indicate nothing—or, rather, so many different things, that the words have lost any scientific signification which they may have had. One of the most common of the affections alluded to is what is known as *Icterus Neonatorum*. It was at one time generally supposed that this very common affection indicated some serious pathological condition, the liver and its function being supposed to be seriously implicated. The chief symptom of this familiar affection is a tinging, more or less marked, of the skin, which becomes of a yellow color. In immature or feeble children, this gradually deepens, and distinctly affects the conjunctiva; while the colorless condition of the evacuations points still more clearly to the analogy which subsists between this and ordinary jaundice. Although it may be too much to suppose, as some have done, that this is a “perfectly natural state, in which the skin and other secreting organs are called on for a few days

reared are more liable to disease, and more likely to succumb to it. On this account alone, were there no other argument in favor of it, it is the duty of the accoucheur to insist, as far as he can, upon all children being reared at the breast; and in the case of children born prematurely, he should absolutely refuse his sanction to any proposal otherwise to nourish it.

The amount of water to be added to cow's milk will, of course, depend upon its quality. If rich and pure, an equal bulk, or even more, of water, may be added; but it is, in towns, at least, rarely necessary to add more than a third of water, in order to reduce an average specimen to the extent which is requisite. Such a mixture as this is, as compared with human milk, deficient in the saccharine element, and it is on that account usual to sweeten it with the ordinary sugar of commerce; but what should always be preferred, when it is within reach, is the sugar of milk, which is now prepared in considerable quantities for this purpose from the whey of cow's milk. The mixture should always be given warm, about blood heat, to which temperature, therefore, it must be artificially raised. A great variety of nursing-bottles have been devised, most of them being simple as well as ingenious in construction, with the object of enabling the child to suck from an artificial nipple at the extremity of the apparatus. In a word our whole object is—when a child has to be reared artificially—to assimilate all the conditions as nearly as possible to those which exist when the natural source is available. The success of bottle-feeding depends very greatly upon the care and experience of the mother or nurse, and upon nothing does the ultimate result hinge more than upon strict attention to cleanliness. It is well known that it is more difficult thus to rear a child in summer than in winter, from the rapidity with which, in the former case, the temperature acts upon the milk. It is also well known that, when the apparatus is not kept scrupulously clean, small particles of curd are apt to accumulate within it or the tube, and these, again, if swallowed by the infant, are more than likely to excite gastric or intestinal disturbance; but these difficulties are fortunately, in a large majority of cases, completely overcome, and the infants, if originally vigorous and mature, are often pictures of health.

So long as, under such alimentation, the functions of digestion and assimilation are perfectly discharged, we may well be content with the condition of the child; but when—as occurs in a certain proportion of cases—the child pines and is *not thriving*, the digestion is impaired, or obstinate diarrhoea supervenes, we must, without delay, adopt means for its relief. It is usual, when at all practicable, to obtain the milk for an infant from one cow, and what, in the condition alluded to, has often been found sufficient is simply to change the cow, as, under other circumstances, we might do with the nurse. But when this and other simple remedial measures fail in producing an effect, and the infant continues to dwine, we should lose no time in urging that a nurse be obtained at once. In many cases this is delayed until the condition of the child becomes critical, and the assistance of the nurse, when eventually obtained, is too late to rally the little sufferer from the condition into which it has fallen; and, in fact, this question often devolves a

serious responsibility upon the medical attendant, who is certainly blameworthy if he fail to interpose his authority before it is too late.

The period at which other articles of food are to be permitted to the child, is another question in regard to which we are often expected to express an opinion. Much will no doubt depend upon the health of the mother, and the abundance or otherwise of the lacteal secretion, but we have great reason to believe that the tendency is considerably to anticipate the period at which a variety of diet is first to be permitted. We think we are justified in concluding that, for the first three months, milk and milk alone is the best as well as the most natural food for the child; but, in this as in most other respects, the safest and most reliable indication is to be found in the condition of the child itself. So long, indeed, as its appearance and development, the manner in which its functions are discharged, and the extent to which it enjoys refreshing and quiet sleep, indicate perfect health, too much caution cannot be exercised in sanctioning any change, unless indeed the interests of the mother should render it imperative.

Of the many substances which have been employed as substitutes for, or supplementary to milk in the alimentation of infants, nothing has, perhaps of late years, attracted more attention than the Food for Infants which was devised as the result of much original research by Baron Liebig.¹ Boiled bread and milk, arrowroot, corn flour, and a host of other simple and easily digested substances are extensively employed, the article selected depending more upon the fancy or prejudice of the nurse than on any marked superiority of one over another. Nothing, we are assured, is better than rusks, if they can be obtained of good quality; and if well made they require no boiling, but are to be covered for a minute or two with boiling water, which is then poured

¹ This may be obtained in any quantity, carefully prepared by eminent chemists, but as its price puts it beyond the reach of the humbler classes, we are induced to borrow some sentences from a little pamphlet published on this subject by a lady, whose main object was to bring the food within the reach of all. "The ingredients required," she writes, "are the following:

Malt,	½ oz.
Second Flour,	½ oz.
Skimmed Milk,	6 oz.
Water,	1 oz.
Bicarbonate of Potash,	7½ grains.

"I may mention here, that after picking out other seeds which are often found among malt, and which may be injurious, the malt should be crushed in a mortar or ground in a coffee mill. Mix all the ingredients together, and put them in a pan thoroughly clean, boil for six or eight minutes, stirring all the time; remove from the fire, strain through an ordinary sieve or piece of muslin, and give to the child through a feeding-bottle. See that the holes in the nipple of the tube are large enough to admit of the food passing through them, and that it be not given too warm. The above quantity daily will be found sufficient for an infant for the first few days; but very soon it will have to be increased to two or three cupsfuls, and more. For a new-born child who has to be fed entirely on this food, it should be made at first half milk and half water. Use *skimmed* milk; new milk is too strong. If properly made the food should be quite sweet, and taste as though sugar had been put into it; but sugar must on no account be used. The quantity required for twenty-four hours may be made at once, and heated for use as required. Malt can be had at the bakers, who use it for making bread. It is dry and slightly crushed, and should be ground fine before using; this can be done in an ordinary coffee mill."

off, and milk or cream, with a very little sugar, added before it is broken up. When the child grows older a little carefully made chicken soup or beef tea may be given twice a week; and, by thus adapting each change of diet with caution, it may be gradually altered so as to suit the increasing requirements of a higher stage of development.

Weaning.—The separation of the child from the mother involves something of a crisis in its existence, and is generally, as might be expected, attended with more or less constitutional disturbance. The condition of the mother must necessarily, as has already been shown, point clearly in many cases to the conclusion that the infant should, in her interest, be at once withdrawn. But, when circumstances are in all respects favorable, it has in every instance to be determined what is the proper period for weaning—what time, in the interests of both, is to be selected for the severance of that physiological tie which binds together the mother and her offspring. It is very unusual to wait until the occurrence of pregnancy, or the condition otherwise of the mother, show clearly that she is no longer able to supply proper nutriment to the child. Were we even to look at the case without any reference whatever to the maintenance of her health, a very little reflection should suffice to show that nursing beyond a certain average period is little likely to maintain the health or well-being of the infant; but as, in this matter, the interests of the mother are in a sense inseparable from those of the child, it is sometimes a question involving both care and discrimination absolutely to fix the time for weaning.

It has frequently been asserted that the natural period for separating the child from the mother is on the completion of the process of dentition; and it may, perhaps, be admitted that, theoretically, the idea is not destitute of validity. Every one knows, however, that, although it may be possible to nurse for two years—the period at which the first dentition is usually completed—the amount of milk secreted ceases long before that to be sufficient for the nourishment of the child. Indeed, the cases are exceptional in which a woman is able to suckle her child, without assistance in the way of extra aliment, for a longer period than ten months; and a large proportion of mothers and nurses require supplementary aid much sooner than this. In cases, therefore, of protracted lactation, the breast-milk is generally an insignificant portion of the total nourishment which is given to the child; and we can scarcely doubt that, under such circumstances, weaning might have long before been effected, in the interest of the infant, as well as in that of the mother. For while, on the one hand, a deteriorated lacteal secretion can scarcely fail to exercise a pernicious influence on the child; so, on the other hand, a long-continued drain on the system is seldom without its effect on the health of the nurse.

With a healthy and vigorous nurse, it is better that the child should have nothing but what she can afford it for the first six or seven months; and, certainly, the practice of feeding the infant during the night, so as to avoid trouble and disturbance to the mother, which has become too common of late, is one to which—save under exceptional circumstances—we should give no countenance. A partial failure in the quantity or quality of the milk may, no doubt, occur at a period very much earlier

than that to which we refer ; so that it may be absolutely necessary, even at the second or third month, partially to feed, while nursing is simultaneously going on. It is, in all cases, advisable to accustom the infant to other food before the breast-milk is withdrawn ; otherwise, the process of weaning is much more troublesome, and is more likely to be productive of unsatisfactory results. When this is done, and when the proper time arrives, the quantity of milk should be gradually and steadily diminished, and the proportion of other nutriment correspondingly increased, until the latter alone remains. Seldom, however, is this effectual without more or less of trouble, arising from the restlessness which the deprivation of the milk excites in the child ; but, if the weaning process has not been too abrupt, the screaming fits and other evidence of discomfort will not last beyond a couple of days. And, as regards the mother, any discomfort which she may experience may be easily kept within moderate bounds by saline laxatives, abstinence from fluids, and the application of belladonna or cooling lotions to the breast, until the gland ceases to discharge its function.

The general health of the child is the point which, above all others, is of importance in its bearing on the period to be selected for weaning. It is proper, therefore, to await the subsidence of any febrile attack, or even of an ordinary catarrh, or some other trifling ailment, before weaning the child ; and it is, we may say, the universal practice to regulate the process, in some measure, by the progress of dentition, which is, as we shall see presently, almost invariably marked by stages, these being separated by intervals, during which such constitutional disturbance as may attend the eruption of the teeth completely disappears. It is well, therefore, to select the latter periods as those at which constitutional irritation is less likely to be engendered. There is, as we may well suppose, the greatest difference in the ease with which children are weaned—the deprivation causing, in one case, scarcely a gesture indicating uneasiness or discomfort, and, in another, a degree of fretfulness, and even of constitutional disturbance, which seems quite out of proportion to the cause. This depends, no doubt, upon the temperament, or, possibly, upon constitutional causes ; but there is every reason to believe that the idea, which has so long obtained, in regard to the bearing which the progress of dentition should have on the question of weaning, is well founded, and ought, in all cases, to be admitted, as affording indications of no small importance. But to attempt to fix absolutely the period of weaning, as applicable to all cases, is as absurd in theory as it will be found to be unsatisfactory in practice, were it for no other reason than the well-known irregularity which attends dentition. In the case of a perfectly healthy infant, and an average result in the eruption of the teeth, we may, however, assume that ten months is a proper period for weaning, as at this time there is usually a pause in the process of dentition, subsequent to the appearance of the eight incisors.

Dentition.—Among the many reasons which indicate the necessity for a careful alimentation of the child during the early months of its existence, there is perhaps none of greater importance than that the system may be prepared for the contingencies which so often attend the

eruption of the teeth. From imperceptible constitutional disturbance, to derangement of all the functions, and convulsions at the cutting of every tooth,—which may be held as indicating the extremes,—cases offer themselves under every conceivable grade of symptom intermediate between the two. There are few more perfect illustrations of the delicate sympathy which exists between functional disturbance and distal irritation, than are afforded by watching the progress of the first dentition. As a rule, indeed, the symptoms are merely those of local irritation; but in a large proportion of all cases, the sympathy referred to is evidenced by more or less of gastro-intestinal derangement, while, in a considerable number of instances, a reflex irritation is manifested in symptoms which indicate, more or less clearly, a disturbance of the nervous centres.

Although, as a general rule, the development of the milk teeth within the jaw involves neither local nor constitutional disturbance, and it is only as they are about to penetrate the gum that the symptoms to which we have alluded first manifest themselves, the influence of the process is sometimes exhibited a considerable time before the teeth upon which the phenomena depend make their appearance. So long as no tumefaction, or other morbid condition of the gum is observable, our treatment can only be expectant, or, at least, directed to the functions which are disturbed; but this is clearly one of the conditions to which we have already referred as indicating the necessity of caution in the matter of weaning,—for there can be little doubt that, in such cases, a change, and especially a sudden change, in the nature of the food, is very likely to be followed by an aggravation in the general symptoms. Such a state of matters is, in fact, sufficient warrant for protracting the period of nursing until more favorable conditions manifest themselves, which will generally be the case on the eruption of the first teeth.

Although the process is subject to many irregularities, the teeth generally make their appearance in a certain order, as is represented in the following formula, where the figures indicate the month at which, in mature and healthy children, we may expect the various teeth, the dentition usually commencing with the incisors of the lower jaw:

Molars.	Canine.	Incisors.	Canine.	Molars.
24 — 12	18	9 — 7 — 7 — 9	18	12 — 24

From this it appears that the milk-teeth—which are twenty in number—come through the gums in the following order. It is, of course, understood that an infant may be born with teeth, or may not have a tooth until several months later than is indicated by the formula, and in either case without a single special symptom. On an average, then, the central incisors make their appearance in the course of the seventh month, and are followed, about the ninth, by the lateral incisors. After this, there is a pause of something like three months, which is the time generally selected for weaning the child. In about three months more the first molars come to the surface; and, at intervals of six months,

the canines and second molars respectively,—so that the dentition is usually completed about the end of the second year. If the delicacy of the child, on the one hand, or premature or irregular eruption of the groups of the teeth on the other, should disturb our calculations, it may be necessary to modify the ordinary routine procedure; and, in any case, the symptoms of irritation, local or general, to which reference has been made, and which indicate the approaching eruption of a tooth or group of teeth, should be held as warranting us in postponing the period for weaning.

A very limited experience in the treatment of the diseases of infancy is sufficient to show that the eruption of the deciduous teeth is intimately connected with many of the most important of these. It has, on this account, been admitted from time immemorial that the management of children during teething, is a point which often involves both responsibility and anxiety. It is, however, a matter which can admit of no doubt that a knowledge of this familiar fact leads in no small number of cases to illogical inferences and slovenly practice. Nothing can well be imagined more irrational than to suppose that all the ailments which may affect the child during the period of dentition depend upon local irritation, due to the impending eruption of the teeth; and it is scarcely less absurd to conclude that all irritation is to be relieved by the promiscuous use of the gum lancet. On the latter point, West well observes, that “such a proceeding is nothing better than a piece of barbarous empiricism, which causes the infant much pain, and is useless or mischievous in a dozen instances, for one in which it affords relief.”

So long as the process of teething is going on quite naturally, or is only accompanied with restlessness or slight fever, the less we interfere the better. The progress of the tooth towards the surface is necessarily slow, but the manner in which the tissues of the gum which cover it are gradually attenuated, so as to admit of its final emergence, form no exception to the generally admirable manner in which nature discharges her manifold functions in the animal economy. And yet it is too much the fashion in many quarters to have recourse to the lancet, in a very large proportion of cases, its use being supposed to be indicated by any, even the most trivial, of the ailments of dentition. In certain cases it is admitted that the lancet is the proper and only treatment; but, the more carefully we watch the natural process, the more cautious do we become in resolving upon lancing the gums of an infant. The conditions which may be admitted as warranting the operation are mainly these: 1st. When the child is suffering, and the tooth is so nearly through that we are sure that cutting down upon it will at once relieve the tension, and permit of the passage of the tooth. 2d. When the gums are swollen, hot, and tender, and obviously more vascular than usual, but in this case we operate, not with the view of bringing the tooth through, but to give relief to local symptoms, upon which the constitutional disturbances may be supposed to depend; and 3d. The occurrence of convulsions during one of the periods of active dentition is generally, and with perfect propriety, looked upon as justifying us in using the lancet, even although the state of the gum may not seem to

warrant the operation. This we do, less from a conviction that the procedure is likely to be efficacious, than in the hope that it may prove so. When a tumid state of the gum is associated with aphthæ, or with that severe variety of inflammation of the gum to which in infants the name of Odontitis has been given, the use of the lancet, far from being beneficial, only makes matters worse. And where, in the case of tense and swollen gums, it is employed, not for the purposes of scarification but in the expectation of bringing the tooth through, there is some reason to fear—and, indeed, this is a point which is very generally believed—that an incision of this kind results in a cicatrix, ultimately rendering the passage of the tooth through the gum more difficult than if we had left it untouched.

The mode of cutting the gum varies according to the nature of the tooth over which we are operating. In the case of the incisors, the incision should be longitudinal, and directly along the cutting edge of the tooth. As regards the molars, again, it is usual to make a crucial incision. While we are inclined to think that the idea of a cicatrix in the gum proving a serious obstacle has been in some degree exaggerated, we think that it is well to avoid, if this be practicable, the possibility of any such result. This may be done in a very simple way by so operating, when we cut or scarify the gums with the mere object of depletion, as to avoid that portion of the surface through which the tooth must ultimately pass. We have generally found that scarification practiced, not over the alveolar ridge, but near the base of that portion of the gum which is chiefly affected, has a perfectly satisfactory effect, and besides this will also be found in most cases to be attended with a more considerable flow of blood than when we proceed in the usual way. It often happens that the effect of scarification of the gums, although marked, is but temporary, and, on that account, it is frequently necessary to repeat the operation again and again, to subdue symptoms which are exceedingly apt to recur.

In the treatment of Odontitis, the lancet should be scrupulously avoided, as there is here a tendency to the formation of troublesome ulceration at the site of any incision or scarification which may be practiced. Our attention should, in such cases, be directed to the state of the digestive functions; and, by a careful regulation of the diet and otherwise—while the local affection is to be met by the application to the affected surface of a solution of borax, with or without the chlorate of potash—the symptoms will generally in some degree be controlled. The latter drug may also be given internally, in the manner suggested by Dr. Hunt, in doses of two grains every four hours.

CHAPTER XL.

PHLEGMASIA DOLENS.

THE PUERPERAL STATE IN ITS RELATION TO DISEASE—PHLEGMASIA DOLENS: NOMENCLATURE—CAUSES; AFTER LABOR, AND WHEN UNCONNECTED WITH DELIVERY—SYMPTOMS: PREMONITORY SIGNS: PAIN: WHITE SWELLING: TENSION: HEAT: CONSTITUTIONAL SYMPTOMS: THE LIMB PITS ON PRESSURE DURING CONVALESCENCE: LOSS OF POWER IN THE LIMB—MORBID ANATOMY: CHARACTER OF THE EFFUSED FLUID: PLUGGING OF THE VEINS: STATE OF THE LYMPHATICS—PATHOLOGY: MILK-LEG: ANGIOLEUCITIS: CRURAL PHLEBITIS: EXPERIMENTS OF MACKENZIE AND H. LEE: VIEWS OF TILBURY FOX: REVIEW OF THE PATHOLOGY OF THE SUBJECT—TREATMENT: IS BLOODLET-
TING JUSTIFIABLE? BLISTERS: BANDAGING: IS CONTAGION POSSIBLE? GENERAL TREATMENT TO BE DIRECTED AS A RULE TO A CONDITION OF DEBILITY: TONIC REGIMEN: ANTISEPTIC REMEDIES—CAUSES OF PROTRACTED CONVALESCENCE.

PASSING now to the consideration of what are essentially Diseases of the Puerperal State, we observe that, apart from such affections as are assumed to belong to the condition referred to, there is ample evidence of a peculiar constitutional sensitiveness, one effect of which is to increase the gravity of symptoms arising from what, under other circumstances, we would call quite ordinary diseases. There is, in fact, no disease to which a recently delivered woman is not as liable as others; but in her case there is this special danger, that what we would call but a trivial ailment may, in consequence of the special conditions under which she is placed, be attended with symptoms of serious and alarming import. An ordinary catarrh, for example, may so disturb that repose of the functions, which seems to be a prominent characteristic of the puerperal state, that an amount of constitutional disturbance is produced out of all proportion to the essential nature of the disorder. A state which is naturally one of calm quiescence is changed to a condition in which a turbulent circulation, arrested secretions, and violent fever, give no small cause for anxiety; and it is on this account that we so carefully guard against the occurrence of such influences as may change the case at once from a favorable into an unfavorable category. All ordinary diseases, then, which are accompanied with what are called febrile symptoms, are looked upon with considerable apprehension, as they are apt to be accompanied, in the special cases in question, with a train of supernumerary symptoms which are held as characteristic of the puerperal state.

It is, perhaps, in a sense, not too much to assume, that what are called the diseases of the puerperal state are merely more marked illustrations of the condition to which we refer. The peritonitis, the

metritis, the mania of a puerperal patient, are thus nothing more than familiar diseases modified by special conditions, one of which is what we have ventured to call, for lack of a better name, a peculiar constitutional sensitiveness. We are amply warranted, however, as the sequel will show, in considering each of these affections with reference to the period succeeding delivery; and we shall find, that, not only are the symptoms modified, but they are so to such an extent as to require, in many cases, a treatment quite different from that which is supposed to be applicable to the disease in its ordinary form.

Phlegmasia Dolens, or Phlegmasia Alba Dolens—the disorder which forms the subject of this chapter—forms no exception to the rule just stated. It is, indeed, more strictly a disease of the puerperal state than many of the affections which we shall have to consider, inasmuch as it is seldom observed save as associated with recent delivery. That the puerperal state is not, however, essential to its manifestation is universally admitted, as it has not unfrequently been met with in women who have never been pregnant, and even in persons of the opposite sex. Few diseases have had a greater variety of designations applied to it than this; *anasarca serosa*, *phlegmasia lactea*, *œdema lacteum*, *white leg*, and *crural phlebitis*, being but a few of the many appellations under which it has been described, a study of which, indeed, is not uninteresting, as it almost gives an epitome of the various pathological theories which have been successively advanced to account for the somewhat peculiar phenomena of the disease. Excluding the very few cases in which it, or a precisely similar condition, has been observed to attack the arm, phlegmasia dolens consists in a white painful swelling of the leg. Although, as we have said, it is not necessarily associated with the puerperal state, it is almost always observed in women who have been recently confined, the period of its occurrence varying from the fifth to the thirtieth day, and, in very exceptional cases, at an earlier or later date than the extremes mentioned. It is more common in pluriparæ than in primiparæ, and is more likely to occur in women who are of a feeble and delicate constitution than in those who are robust. In a very considerable number of cases, it has followed the various accidents and complications of delivery, and has even been noticed to occur more frequently after removal of a retained placenta. All English writers on the subject agree in asserting that it usually attacks the left in preference to the right leg, which Mr. White of Manchester seemed to think was due to the fact of women in this country habitually lying on the left side during labor; while Dr. Ramsbotham supposed that it “may possibly, in some inexplicable manner, be dependent on the different distribution of the right and left spermatic vein—the right terminating direct in the vena cava, the left in the renal.”

In no class of cases has it been so frequently observed as in women whose strength has been reduced to a low ebb by hemorrhage either during or after labor; and this, no doubt, accounts for the observation made by Merriman that it is relatively of common occurrence after placenta prævia. Women who have once suffered from phlegmasia dolens are by no means so liable to it in subsequent pregnancies as we might perhaps be disposed to anticipate; and it has generally been

observed that when it does so recur, the subsequent attacks are much less violent. Mr. White says that he never knew it happen to a woman more than once; but this does not tally with the experience of most modern practitioners. One very troublesome and annoying peculiarity of this affection, is the tendency, exhibited unfortunately in a considerable proportion of cases, which the disease has, after having partially run its course in one leg, to be transferred to the other, and there pass through the same tedious stages, still further reducing the strength of the woman, and postponing the period of her convalescence—it may be by several months.

It may be interesting here to mention the circumstances under which phlegmasia dolens has been observed when unconnected with recent delivery. Puzos and, since his time, many modern writers have recorded cases in which all the usual phenomena have been manifested in the course of pregnancy. In a more considerable number of instances, it has been observed as occurring after abortion, particularly in cases in which the placenta or any other portion of the ovum has been left behind. It has also been found to occur after the removal of polypi, the enucleation of fibrous tumors, and the operation of lithotomy. In another class of cases, to adopt the classification of Dr. Tilbury Fox, it may be met with as part of a *general* disease. Under this head he includes those instances in which it has been developed as one of the distressing phenomena of puerperal fever; and, occasionally, in cases of ordinary continued fever, a similar complication has been found to arise. With this variety are ranged three cases in which it was observed to coexist with dysentery, erysipelas, phthisis, and what Dr. Humphry described as a “preternatural coagulability of the fibrin of the blood.” A considerable number of instances have been recorded in which the disease has been associated with malignant growths, not in the pelvic region merely, which we could more readily understand, but as affecting distant organs, such as the stomach or the mammary gland. In a third class of cases, still observing the classification of Dr. Fox, phlegmasia dolens is met with as complicating other *local* diseases; and under this head are ranged, and all on sufficient authority, examples of iliac abscess, suppressed menstruation, hæmorrhoids, hepatic disease, and dislocation of the shoulder. These exceptional cases have, as we shall find, an obvious and important bearing on the hitherto obscure pathology of the affection.

Symptoms.—As in most other diseases the violence and typical distinctness of the symptoms of phlegmasia dolens vary considerably; and in some cases they are so feebly marked that we have difficulty in determining whether the case should be classified under this head or should be considered as a simple case of œdema. In an ordinary case the symptoms may either come on suddenly, when they are often ushered in by a rigor of some severity, or they may manifest themselves more insidiously, when certain premonitory signs are frequently noticed. These are generally—in the puerperal variety, to which we shall in future exclusively refer—a feeling of weight and discomfort in the hypogaster, extending round the brim of the pelvis, which is soon replaced by actual pain, accompanied with more or less of constitutional

disturbance. The pain is commonly referred more particularly to the inguinal region on the side which is about to become the seat of the disorder. We have more than once noticed that pain is complained of in the region of the hip-joint; but as this is not mentioned by other writers on the subject, we infer that the occurrence is exceptional. Dr. Denman describes, as a premonitory symptom, that "before the appearance of any swelling, or sense of pain in the limb about to be affected, women become very irritable, with a sense of great weakness, and grievously oppressed in their spirits, without any apparently sufficient reason; complaining only of transient pains in the region of the uterus, and from these the approach of the disease has frequently been foretold." The pain commencing, as has been described, in the inguinal or pelvic region, extends downwards, and as the various districts of the thigh and leg become successively invaded by it, the swelling of the limb steadily advances in the same direction, until, at the height of the disease, the whole limb presents the white, glazed, and sometimes enormously swollen condition which is so eminently characteristic. This is further accompanied by a complete loss of power, the patient being quite unable to move the limb, or indeed to change her position in bed without assistance. The tissues are tense and elastic, but, although they yield before the finger, they do not pit on pressure after the swelling has assumed its characteristic appearance. The temperature of the limb is usually increased.

Notwithstanding the great swelling of the limb, the veins can generally be distinctly felt, hard and rolling under the finger like a thick cord. This is more particularly the case in regard to the femoral vein, which may often be traced from the groin downwards, although the pressure gives rise to considerable pain. The swelling in some cases extends to the hip and vulva. The glands of the groin participate in the irritation, and sometimes become affected with well-marked inflammatory action, although they very rarely suppurate. The action obviously extends to the lymphatics, and sometimes the only appearance which varies the surface of the white limb is a faint red streak here and there indicating the situation of the affected vessels. A similar appearance, which, in this case, is more diffused, has also been observed over the course of the venous trunks. It was first remarked by Dr. Stokes—an observation which has been corroborated by Dr. Churchill—that the amount of the swelling is no proof of the severity of the disease; but that, on the contrary, "the severity of the constitutional symptoms is often inversely as the swelling of the limb."

In a certain number of cases the symptoms run a somewhat different course. Obviously, in the instances referred to, the disease does not originate in the pelvis, and is ushered in by no such preliminary pelvic symptoms as have been described above. "Sometimes," says Burns, "there is no uneasiness in the belly, and the first symptom is sudden pain in the calf of the leg. Within twenty-four hours after the pain is felt, the limb swells, and becomes tense; it is hot, but not red—it is rather pale, and somewhat shining." It is a matter of considerable importance that the peculiarities of this variety, which is by no means

uncommon, should be borne in mind, for otherwise the idea of "crural phlebitis," which is very commonly supposed to express the pathology of the disease, might altogether divert our attention from symptoms which are nevertheless identical in all important particulars with those which are truly characteristic of phlegmasia dolens, the only difference being that, in the cases which we are here considering, the disease begins below and thence extends upwards.

The constitutional symptoms are just such as one might anticipate from a local affection of such importance. The lochial and lacteal secretions are either arrested or modified, and in the case of the former, the discharge sometimes becomes offensive. The degree of the fever is indicated by the frequency of the pulse, which is seldom under 120. The complete loss of appetite, the furred tongue, and the state of the evacuations, all show how much the gastro-intestinal functions are disturbed. The patient is restless, sleepless, and complains much of thirst.

After a time, which varies much in different cases, all the symptoms undergo an improvement. The fall of the pulse, and the subsidence generally of the constitutional symptoms, are accompanied both by relief of pain and a diminution in the swelling of the leg. A remarkable change now takes place in the character of the swelling, as it is no longer elastic and resistant, but pits on pressure like ordinary œdema; and this change is sometimes observable before there is any very marked difference in the size of the leg. The loss of power in the limb, most marked in cases where the swelling has commenced at the groin, is often very persistent, and is one of the last symptoms to yield. We may expect, therefore, occasionally to meet with cases in which, in the absence of all evidence of constitutional disturbance and apparently of local change, this paralyzed condition of the leg remains for months and even for years. In some cases of exceptionally long continuance of immobility, there remains a permanently thickened condition of the tissues, which may somewhat increase the circumference of the limb. In most cases, the ordinary sensibility of the leg is affected for a considerable time, and the patients often complain of what Dr. Churchill graphically describes as a *wooden* feel, which may persist in a degree for a long period. A varicose condition of the veins has been sometimes observed after phlegmasia dolens, which has been supposed by some to be due to a special morbid condition.

But, while the great majority of cases thus end in resolution, and ultimately in satisfactory although possibly tardy convalescence, it is not always so. For, in a few, suppuration occurs, in the limb itself, in the inguinal glands, or within the pelvis, in which latter case it may be difficult to say which is the primary and which the secondary disorder. As the result of such suppuration, and, in some very rare instances, of gangrene, the exhaustion is so great that the patient succumbs, but so uncommon is such an event that the opportunities which have been afforded for the examination of the white leg after death are extremely rare. Let us see, however, what are the facts which morbid anatomy has disclosed.

"On opening the limb," says Churchill, "it is found to be extended with serum, effused into the cellular membrane." This assertion is no

doubt correct, but it is incomplete, and being so is apt to lead to an erroneous assumption. The words quoted will serve equally well for the description of what is observed when we cut into a part distended by ordinary œdema; but the symptoms already detailed show one thing at least very clearly, that phlegmasia dolens is something essentially different from œdema. It has been found, moreover, that the fluid which exudes in the latter condition is watery in its nature; but carefully observed facts have shown that the limb, and especially the fibro-cellular and cutaneous tissues, are distended in phlegmasia dolens, with a peculiar serosity which is more or less coagulable. Again, thrombus or plugging of the venous trunks of the limb, usually in the neighborhood of the groin, has been so constantly observed that it may be assumed as a phenomenon essential to the disease. This may exist with or without inflammation of the coats of the vessels. And, further, the great majority of observers have noted that the lymphatics are also affected, their main trunks and more important glands often yielding evidence of inflammatory action, which in the latter situation has occasionally gone on to suppuration.

Pathology.—The symptoms, morbid appearances, and even the varieties in nomenclature, all strongly point to one conclusion,—that the pathology of this disease has given rise to many differences of opinion, is in itself peculiar and perplexing, and remains, even at the present time, still somewhat obscure. It was at one time generally believed that the “white leg” was due to the presence of milk in the limb, and the idea was so far favored by the fact, that in most cases the lacteal secretion disappears. It is, however, somewhat surprising to find Puzos and Levret giving their countenance to an idea so absurd; for, although pathology in their days was still in its infancy, their assumption was far less advanced than the views of Mauriceau, who held, at a period seventy years earlier, an opinion which, indeed, comes pretty near some quite modern doctrines, when he describes the accident as one “which often succeeds pain in the ischiadic region, and is caused by a reflux,—which takes place on those parts,—of the humors which ought to be evacuated by the lochia.” The believers in this theory of a metastasis of the milk recommended that the child should be kept constantly to the breast.

Towards the end of the last century, the subject attracted considerable attention in this country. Mr. White of Manchester then advanced the theory that the disease depended on obstruction, or on some other morbid condition of the lymphatic vessels and glands of the affected part; and subsequent writers suggested rupture of the lymphatic vessels, or an inflammatory condition of the same parts, as the morbid condition to which the familiar phenomena of the disease were, at least primarily, to be attributed. The opinion adopted by Dr. Hull was, that phlegmasia dolens consists “in an inflammation of the muscles, cellular membrane, and inferior surface of the cutis, extending, in some cases, perhaps, to the large bloodvessels, nerves, lymphatics, and glands.” This, which was sarcastically called by Davis, “Dr. Hull’s capacious theory,” indicates a belief that the disease is due to inflammatory action, but it otherwise throws no light upon the subject. Up

may be excited by the presence of various unhealthy matters in the blood circulating with this fluid, and determined upon particular portions of the venous system; 5. That the origin of the disease is therefore to be sought for rather in a vitiation of the circulating fluid than in any local injury, inflammation, or disease of the veins."

Mr. H. Lee also performed a series of experiments conducted on a somewhat similar principle. His observations were meant to show, and, in point of fact, did clearly show, that it is by no means an easy matter to excite inflammatory action in the lining membrane of veins, even although irritant or septic substances be introduced into the veins and brought directly into contact with their lining membrane. These results are in perfect harmony with those which, quite independently, were obtained by Dr. Mackenzie. Experiments were also devised by the latter with the view of determining the effect of irritation on the external coats of the vessels; and, although he injured and irritated their coats in various ways so as to excite localized inflammatory action, he found that such inflammation showed little tendency to spread, and that the lining membrane remained free from any effect arising from the irritation applied to the external parts of the vessel. Dr. Mackenzie quite admits that coagulation of the blood contained in a vein is one of the phenomena of true phlebitis; but he insists, and, we think, proves, that changes in the blood, due to septic action, may produce a thrombus with equal certainty. The effect of an admixture of pus in precipitating the fibrin is clearly demonstrated in the following experiment, which is one of those performed by Mr. H. Lee: "Some blood was drawn from a healthy horse and poured into three vessels capable of containing three ounces each. The blood in the first vessel was allowed to remain as a standard of comparison. To that in the second vessel was added some viscid matter from an indolent tumor in the horse's neck; to that in the third, some pus from a chronic abscess. The contents of the third vessel (blood and pus) began to coagulate in three minutes; the mass was firm in four. In eight minutes the contents of the first and second vessel had become firm."

Dr. Tilbury Fox, in two very able papers, communicated to the Obstetrical Society of London in 1861, and published in their Transactions for that year, enters very fully into the subject, and strongly opposes the view that phlebitis is an essential phenomenon of phlegmasia dolens. His leading idea is, that the cause of the peculiar phenomenon of white leg "is an impediment to the return of blood *and lymph* from the affected part;" and he goes on further to observe, "that the causes of such impediment may be, so far as regards the vessels, *extrinsic* and *intrinsic*." The extrinsic causes comprise all cases of pressure on the vessels from tumors, abscess, &c. The intrinsic causes, again, are all assumed to produce coagulation, and the more important of these are: 1. Phlebitis, septic or non-septic; 2. Introduction of morbid matter into the vein, producing simple thrombus, but not phlebitis; 3. Preternatural coagulability of the fibrin of the blood, as assumed, and, in a manner, proved by Drs. Humphry and Graily Hewitt. While not denying the possibility of crural phlebitis being associated with, or even preceding the phenomena of phlegmasia dolens, Dr. Fox argues with

prior to the occurrence of phlegmasia dolens, and that the latter is frequently thus evolved. Prop. V. These different modes of evolution may be more or less conjoined."

On a review of the whole subject, and setting aside such of the older theories as are clearly incompatible with the possibilities of modern pathology, we cannot but admit that phlegmasia dolens is still a matter in regard to which we have much to learn. That obstruction of the venous trunks, from whatever cause arising, is essential, we do not question; but it is clear that this will not account for the phenomena which we observe, since the symptom which, above all others, is held to be indicative of an obstruction to the venous return,—œdema, to wit,—is, during the active stage of the disease, absent. Nor do we believe that the simple theory of phlebitis can be accepted as a solution of the problem, in so far, at least, as this may be considered the proximate cause of the disease. No one can dispute that phlebitis causes coagulation of the blood contained in the affected vein. In those cases of phlegmasia dolens in which the affection has been associated with the more serious varieties of puerperal fever, clear evidence of inflammation of the coats of the veins has been observed; and the theory referred to has received still further corroboration from the observation of Dr. Robert Lee, who traced such venous inflammation to its most probable source, in the uterine branches of the hypogastric vein.

But, on the other hand, it has been satisfactorily demonstrated, both by Dr. Mackenzie and by Mr. H. Lee, that the veins, and especially their lining membrane, are singularly averse to taking on inflammatory action; and it has also been shown, with almost equal certainty, that the deeper color of the membrane referred to is not a necessary indication of inflammation, but is due rather to the action of the coloring matter and the contact of the clot. But were we even to admit that phlebitis is an essential part of the disease now under discussion, there is no sufficient evidence that the one condition depends upon the other. If we study the description given by surgical pathologists of the affection known as "fibrinous phlebitis," with which alone phlegmasia dolens can fairly be compared, we find that, among the more important of the symptoms which are detailed, swelling of the limb below the affected part and œdema of the surrounding cellular tissues are among those which are most prominently put forward. In no single case, so far as we know, since M. Breschet first demonstrated and named the affection, has phlebitis been described as involving, in the case of a limb, the white, elastic, painful, and benumbed condition which is so diagnostic of the other disease. We do not hesitate, therefore, to reject the term "crural phlebitis" as synonymous with phlegmasia dolens.

While giving every weight to the authority of such names as Denman, Caspar, and Dewees, we confess that the theory with which their names are associated is even less satisfactory than the other, for were we to admit that angeioleucitis may account for the appearance and character of the swelling, this affords no explanation whatever of the fact that the veins are plugged with clots. We may, indeed, be perfectly sure that to them the fact last mentioned was unknown, for had it been brought under their knowledge it could scarcely have failed

cannot see that this must necessarily be admitted as a serious difficulty ; for if the proximate cause of the disease is assumed to be a septic action proceeding, in a great majority of cases, from the recently denuded uterine surface, it is surely not too much to assume that, in exceptional cases, the septic action which leads to coagulation may proceed from intrinsic causes, or even from poison introduced in some other way from without, as in Dr. Tilbury Fox's case above alluded to.

It is, however, scarcely possible to avoid the conclusion that a septic action and the resulting coagulation cannot satisfactorily account for all the phenomena of the disease. All that is necessarily involved in such an hypothesis is mechanical obstruction in a venous trunk, from which we could only anticipate œdema as a direct result. To the development, therefore, of the white elastic swelling something more is required ; and this forces upon our notice the inquiry as to what are the auxiliary or supplementary conditions referred to.

No modern writer on the subject ventures to advocate the theory, which at one time had the support of the most distinguished obstetricians of the age, that the seat of the disease is essentially in the absorbent or lymphatic system. The facts demonstrated with reference to the veins preclude such a belief. But it by no means follows that the absorbent system takes no share in the development of the symptoms alluded to. The red streaks occasionally observed over the course of the larger lymphatic vessels, and the exceptional occurrence of inflammation and suppuration in the glands, prove quite clearly that they may be involved. But there are other considerations which seem to indicate something more than this, and that an affection of the lymphatics is an essential, although, probably, a secondary part of a typical case of phlegmasia dolens. If we assume, as some of the most distinguished of modern pathologists have done, that the lymphatic system affords the channel through which fibrin is introduced into the blood, we can readily understand why an obstruction in the vessels of that system, whether inflammatory in its nature or purely mechanical, may cause many of the essential phenomena of the disease. Plugging of a venous trunk could but cause œdema ; but venous obstruction, *plus* an impediment to the circulation in the lymphatic system, may very readily be assumed to cause symptoms very like those which we have already described. "If there be any relation," says Dr. Fox, "between the lymphatic fibrin and the cellular tissue, it is easy to understand how obliteration of the lymphatics may give rise to the peculiar character of phlegmasia dolens, on account of the retention of the fibrinous material in the tissues,—the cellular especially, which is so rich in lymphatics. . . . The cellular tissue itself seems to be hypertrophied, the lymph also gelatinizing in its interstices."

The marked loss of power in the affected limb, out of all proportion to the mere amount of swelling, and which is, as we have seen, frequently of long continuance, seems, at one time, to have led to the idea that the nerves were primarily involved ; and M. Dugès has certainly shown that, in some cases at least, inflammation of the nerves and of their sheath occurs. It seems to us, however, that serious lesion of the nervous trunks is, even from a purely theoretical point of view, by no

would probably think of general bloodletting, but it is commonly taught that leeches should be applied over the course of the affected vein; and, indeed, the rules for treatment which are laid down by many writers on the subject are such as to convey the impression that leeches are applicable to all cases. Such an idea is, of course, at variance with the view which we have expressed as to the nature of the disease, and cannot, certainly, be admitted as a safe guide to judicious treatment. The cases, in fact, to which the application of leeches is advisable are those only in which there is evidence of a local inflammatory action, which may very readily be induced under such circumstances, either in the lymphatics or in some other of the tissues of the limb. But even a clear indication of true inflammation does not necessarily warrant depletion, for we must first—and this is the most important point of all—be sure that the affection has not sprung from debilitating causes, for if it be so, to bleed is simply to encourage exhaustion, and to facilitate the absorption of septic materials. Bloodletting, then, we believe to be applicable to that comparatively rare class of cases only, in which inflammation exists in the absence of constitutional exhaustion.

Considerable benefit appears to have been derived in many instances from the application of blisters to the leg. Some have gone so far as to say that, in the treatment of this disease, blisters are to be regarded as specifics, but this is evidently a pardonable exaggeration. They may be applied, as we believe, with a reasonable prospect of success, in cases where there is inflammation, and where the general condition of the patient prevents us from having recourse to bloodletting; and there is certainly one effect upon which we may count with some confidence—that being a cessation, or at least an alleviation, of the pain which is so characteristic a feature of the more severe examples of the disease. Otherwise, the only effect which is likely to be derived from this method of treatment differs in no respect from that which, under similar conditions, we anticipate from the action of counter-irritation of any kind. Probably Dr. Churchill is quite correct when he says that although his own experience is decidedly in favor of the utility of blisters, “in many cases turpentine fomentations will answer equally well.”

Bandages, if judiciously employed, are extremely useful in the cure of phlegmasia dolens. To the early stage, while the swelling is rapidly being developed, firm bandaging is for obvious reasons inapplicable, and might very possibly be attended with further arrest of the circulation, and sloughing similar to what has occasionally occurred from careless or unskilful bandaging in surgical practice. What is at this period safer and more judicious is to swathe the limb in fomentations, which, if the pain be severe, may be sprinkled with laudanum. On the subsidence of the more acute symptoms, bandaging may always be resorted to, at first with flannel and subsequently with an ordinary roller bandage. What may be safely held as indicating the period at which bandaging is proper, is when the limb pits on pressure, this pitting being probably impossible until the permeability at least of the lymphatic trunks has been restored.

Certain facts which have been observed with reference to the progress of these cases have suggested a suspicion that, in its more severe varie-

thus but feebly discharged. It is much more probable, however, that changes take place in the clot, which ultimately result in the restoration, partial or complete, of the circulation within the vessel. "The blood," says Murphy, "has the power of separating from itself a fibro-albuminous element without the intervention of any membrane, and independently of any inflamed surface. Through this medium, the coagulum becomes adherent to the sides of the vein (as in the old aneurismal sac); and if it be attached to the whole circumference, the inner portions become softened and broken down. A complete cylinder of fibrin may in this way be formed in the interior of a vein, through which (when the fluid portions of the coagulum are removed) the blood will circulate." We need scarcely wonder, then, that the results of treatment are often unsatisfactory, and convalescence proportionally tardy.

CHAPTER XLI.

PUERPERAL INSANITY.

NOMENCLATURE—NORMAL EFFECT OF PREGNANCY ON THE MIND—INSANITY ASSOCIATED WITH PREGNANCY, LABOR, OR LACTATION—TRUE PUERPERAL INSANITY: PATHOLOGICAL THEORIES: CONNECTION OF PUERPERAL INSANITY WITH ALBUMINURIA—PUERPERAL MANIA: TO BE DISTINGUISHED FROM PHRENETIS: IS ESSENTIALLY A DISEASE OF EXHAUSTION—SYMPTOMS: SIGNIFICANCE OF A RAPID PULSE: VIOLENCE: DELUSIONS—PROGNOSIS—PUERPERAL MELANCHOLIA: DISTINGUISHING CHARACTERISTICS: PROBABLE TERMINATIONS—TREATMENT: PREVENTION: BLOODLETTING TO BE AVOIDED: MANAGEMENT OF THE DIGESTIVE FUNCTIONS: EMETICS: VASCULAR SEDATIVES: NERVOUS SEDATIVES; OPIUM, HYOSCYAMUS, CHLORAL, ETC.: DIET AND REGIMEN: SECLUSION AND RESTRAINT: TREATMENT DURING CONVALESCENCE—TENDENCY TO RECURRENCE AFTER SUBSEQUENT LABORS.

THE term Puerperal Insanity is here chosen in preference to the more familiar designation of Puerperal Mania, for the obvious and, we think, very sufficient reason, that the forms under which mental aberration may occur, in the puerperal state, are various, and the proportion of cases in which the symptoms are of such a nature as to fall under the category of Mania, is by no means so overwhelming as to justify the exclusive use of that name.

It requires no very close observation of pregnancy and the puerperal state, to discover that the mental as well as the bodily functions are, in a very considerable proportion of all cases, disturbed. The psychological phenomena to which we here refer, are far from being symptomatic of mental unsoundness, or what we call insanity, but are indicative merely of the presence and operation of some disturbing influence, dependent, doubtless, upon the condition in which the woman is placed. For example, it is by no means an uncommon thing—as we had occa-

cases which occur in private practice, and which are, from first to last, treated at home, or under private supervision. The statistics of the subject further teach us, that primiparæ are more liable than pluriparæ, and that the class of cases in which susceptibility to puerperal insanity is most marked, are those in which women between the ages of thirty and forty are confined for the first time. In a considerable number,—it is said, indeed, in about half of all cases encountered in practice,—hereditary predisposition has been noted; and it would further appear, that complicated and exhausting labors are much more frequently followed by insanity than those in which the course of labor has been normal. It was first pointed out by Esquirol, and the observation has been confirmed by others, that unmarried women, who feel deeply the degradation of their position, are much more susceptible than others. These then, in addition to the functional susceptibility which is so characteristic of the puerperal state, may be confidently admitted as predisposing causes. But, as regards exciting causes, and the pathology of the disease, there is little upon which we can rely. Cold, imprudence in diet, sudden mental shock, disordered bowels, and a number of other similar conditions, have been generally assumed as causes of puerperal insanity; but most of them, as it appears to us, on insufficient evidence.

From a pathological point of view, the etiology of the subject is even more obscure. We may readily obtain, by observation, abundant evidence of the sympathy which subsists between the uterus and the cerebrum, and we need, therefore, scarcely wonder that attempts have occasionally been made to connect the mental disturbance with uterine lesion. But although we may admit that a certain number of authentic cases have been advanced on undoubted authority, and were we even to concede that metritis may apparently be the proximate cause of insanity in some instances, it is abundantly evident that, in the great majority of cases, no such cause exists. Other instances—to which the same observation may apply—have been recorded, in which there was an apparent connection between the mental disorders to which we refer, and ovarian or peritoneal inflammation. Some writers—among whom we may mention Burns and Davis—were of opinion that the disease was of inflammatory origin, and described it as a modification of phrenitis; but modern experience thoroughly corroborates the view which was taken by Gooch, “that the disease is not one of congestion or inflammation, but one of excitement without power”—an opinion which derives most ample confirmation from the narrative which he gives, in his admirable thesis on this subject, of eleven cases in which there could at no time have been any inflammation of the structures within the cranium. Dr. Ferriar supposed that the loss of reason, in most cases, was mainly due to some interference with the establishment of the function of lactation. On this subject he remarks: “I am inclined to consider puerperal mania as a kind of conversion. During gestation, and after delivery, when the milk begins to flow, the balance of the circulation is so greatly disturbed as to be liable to much disorder from the application of an exciting cause. If, therefore, cold affecting the head, violent noises, want of sleep, or uneasy thoughts,

some other organic toxicological agent, possibly of an *alkaloidal* character. "In the blood of the puerperal female," he writes,—“greatly modified as it is in the normal states of pregnancy and delivery, and containing as it does after parturition the effete elements of the involving or disintegrating uterus, and the materials for the new lacteal secretion—ferments and agents may possibly exist which are more apt to develop special morbid poisons out of the retained renal excretions, than happens in other states of the system. But, I repeat, the whole subject is yet quite dark and conjectural, and will remain so till pathological chemistry is able to cast some light upon it.”

Dr. Donkin, of Newcastle, contributed a very excellent paper on this subject.¹ Recognizing the fact that puerperal insanity may present itself under a variety of forms, he deduces from the history of recorded cases, facts which appear to him to warrant the conclusion “that the acute dangerous class of cases are examples of uræmic blood-poisoning, of which the mania, rapid pulse, and other constitutional symptoms are merely the phenomena; and that the affection, therefore, ought to be termed uræmic or renal puerperal mania, in contradistinction to the other form of the disease.” Although most persons, familiar with the subject, will probably consider that Dr. Donkin goes too far in thus treating the matter as a fact conclusively demonstrated, his paper is replete with interest, and will well repay the trouble of perusing it.

The form of puerperal insanity which is of most frequent occurrence is that in which the symptoms are commonly manifested within a fortnight after delivery, and present with greater or less distinctness the characteristic features of acute mania. It is to this alone—the *paraphrosyne puerperarum* of Sauvages—that the designation “Puerperal Mania” can with perfect propriety be attached. Of fifty-seven cases noticed by Burrows, thirty-five were maniacal, sixteen melancholic, and eight alternating; and, although the relative proportion of cases has varied according to the experience of various writers, all agree that the maniacal cases are greatly in excess of the others. This is, no doubt, the class of cases, the observation of which by the earlier writers on the subject gave rise to the idea that the violence of the symptoms was due to inflammation. It were absurd to deny that phrenitis is possible in lying-in women as in others; but no one now questions the accuracy of the statement made by Gooch, “that furious delirium from inflammation of the brain is a rare disease in childbed.” What seems to have given, for a time, apparent confirmation to the inflammatory theory was the fact that in fatal cases of puerperal mania, the brain was found congested. The experiments of Dr. Kelly, upon the lower animals, and a host of pathological facts which have been put on record since his day, have conclusively proved to demonstration, what is familiar to every modern pathologist—that death from hemorrhage and other exhausting causes, produces in the brain that very appearance of increased vascularity which, as we assume, was accepted by Burns, Davis, and others, as evidence of inflammatory action.

Although, therefore, we admit phrenitis to be classed as a *possible*

¹ Edinburgh Medical Journal, May, 1868.

her husband, or, what is still more usual, her child; that it is dead or stolen; and if it be brought to her, nothing can persuade her it is her own; she supposes it to belong to somebody else; or she will fancy that her husband is unfaithful to her bed, or that he and those about her have conspired to poison her. Those persons who are naturally the objects of her deepest and most devout affection, are regarded by her with jealousy, suspicion, and hatred. This is particularly remarkable with regard to her newly born infant; and I have known many instances where attempts have been made to destroy it, when it has been incautiously left within her power. Sometimes, though rarely, may be observed a great anxiety regarding the termination of her own case, or a firm conviction that she is speedily about to die. I have observed upon occasions a constant movement of the lips, while the mouth was shut; or the patient is incessantly rubbing the inside of her lips with her fingers, or thrusting them far back into her mouth; and if questions are asked, particularly if she be desired to put out her tongue, she will often compress the lips forcibly together, as if with an obstinate determination of resistance. One peculiarity attending some cases of puerperal mania is the immorality and obscenity of the expressions uttered; they are often such, indeed, as to excite our astonishment, that women in a respectable station of society could ever have become acquainted with such language."

We have no reliable information as to the number of cases which prove fatal, but there is no doubt that one of the most important symptoms as indicating the probability of a fatal result is extreme rapidity of the pulse. "Mania," said William Hunter, "is not an uncommon appearance in the course of the month, but of that species from which they generally recover; when out of their senses, attended with fever like paraphrenitis, they will in all probability die." Gooch corroborates generally this assertion, and narrates in illustration a very interesting case: "One evening, several years ago, a surgeon called upon me, wishing me to return with him many miles into the country, to see his wife, who had become maniacal a few days after her delivery. I was at that time attending a lady in her first labor whom I could not leave, but I offered to go with him if he would wait till the labor was over. It was going on wearily, there was no prospect of its being over before the morning, and as he was anxious to return home, he took another physician whom I recommended. Before leaving me, however, he said he should like to talk with me about the case. I took down a volume of Dr. William Hunter's manuscript lectures and showed him this passage (quoted above). He said he was sorry to read it, for that his wife's pulse was very rapid. About a week afterwards, I heard that she was dead." It would appear, however, as if the views of Hunter and Gooch had found too literal an interpretation in many modern treatises, for it would almost seem to be the deliberate opinion of some, that a rapid pulse meant death and a slow one recovery. The pulse is probably the most certain indication which we have, but it is not to be relied upon solely, to the exclusion of others. Extreme rapidity in the beats is in this, as in all the other more serious disorders of the puerperal state, a symptom of grave import; but too much has been made of it;

questions of deep interest in individual instances. As regards the risk to life, it is, as we have attempted to show, an error to suppose that a rapid pulse is necessarily the forerunner of death. But there is another error, which at one time led to a contrary belief. This finds expression in a remark which Dr. Gooch attributes to Dr. Baillie, who, when consulted about a case, remarked "that the question was not whether she was to get well, but when she was to get well." To this Gooch adds dryly, "the patient died a week after this prognosis." The fact is, that death from puerperal insanity does now and again occur, and more frequently from the maniacal than from the melancholic form. Dr. Churchill says that he should himself lay great stress, in forming a prognosis, upon the presence or absence of uterine complications, and the observation, coming from such a source, merits careful attention.

The question of prognosis involves not only the danger to life, but the prospect of speedy restoration to reason. In this respect, in so far as mania is concerned, we may look forward with considerable confidence, especially in the absence of hereditary predisposition, to an early recovery. "Within three weeks," says Dr. J. B. Tuke,¹ "or more frequently earlier, the mania gradually subsides, and is replaced by a state of dementia, generally accompanied by delusions, which almost invariably assume the form of mistaken identity. These gradually disappear, leaving a haziness of apprehension, and a state suggesting the idea of waking from a dream. The patient can now, generally, be induced to work, and otherwise employ herself. From that moment you may look with almost certainty to ultimate recovery." There are cases, however—chiefly those of hereditary taint—in which the delusions become confirmed, and in which, although the general health may have been quite restored, the mental aberration is persistent. Dementia, of a more serious nature than that mentioned by Tuke, gradually takes the place of mania, and hopeless chronic insanity is the result.

Although in the insanity of pregnancy the majority of cases are of the melancholy type, it is otherwise with true puerperal insanity; where melancholia, although by no means rare, is, as compared with mania, comparatively unfrequent. Few cases which, from the first, come under this category, present characteristic symptoms earlier than the sixteenth day, and a large proportion of cases come on considerably later than this. All at first may go on to our perfect satisfaction; the patient has been able to leave her bed at the usual time; her appetite is good; she sleeps well, and is able to nurse her child; it is assumed on all hands that convalescence has been satisfactorily established. Perhaps a month after the birth of the child, a change comes over the mother, which, to her attendants, is quite inexplicable. The pride and interest in a first-born child gradually fade away, and a cloud of sadness, utterly without cause, slowly spreads itself over the aspect and demeanor of the mother. Causes, which are either imaginary, or, if real, are of the most trivial character, give rise to fits of silent weeping, during which the patient is not demonstrative, and rather avoids than seeks sympathy. The gloom deepens as the curtain falls. No longer

¹ Edinburgh Medical Journal, May, 1865.

given most attention to the subject, it would seem that the existence of albumen in the urine has no such marked association with puerperal melancholia as it has with mania of the same class; but this is a point in regard to which more extended clinical study is still required.

Treatment.—From every aspect of the case, the treatment of puerperal insanity is a subject of surpassing clinical interest, and one which deserves, we venture to assume, more attention than has, in some systematic works, been accorded to it. This is particularly the case as regards prevention; for we can scarcely doubt that, when the symptoms are such as to indicate disturbance of the cerebral functions, much may be done, in the way of warding off an attack, by a judicious employment of the remedies to be hereafter mentioned. This remark applies chiefly to cases where there is a marked hereditary taint, or where the patient has been insane at previous confinements. An illustration of the latter came recently under the notice of the writer.

A delicate lady, who had married very young, became insane (maniacal) about ten days after her first, and nine days after her second confinement, and on the latter occasion the convalescence had been extremely protracted, and the danger to life at one time great. Much anxiety was naturally felt by herself and her friends on the approach of a third confinement, particularly as, towards the end of the ninth month, she became hysterical, sleepless, and melancholy, as on the former occasions. A very remarkable feature in the case was the tendency to dreams of a disturbing kind, which not only rendered such sleep as she obtained unrefreshing, but made her actually dread falling asleep. The state of the tongue and dejections indicated considerable derangement of the digestive functions. As the period of expected delivery approached, the symptoms became still more marked; but they seemed to be, in some degree, under the control of the remedies which were adopted, the most effectual being hydrate of chloral for the nervous symptoms, and colocynth, with hyoscyamus, for the bowels. Labor passed over quite favorably, and in every respect satisfactorily, the patient being, however, as might have been anticipated, very feeble and exhausted after its completion. After delivery, very strict precautions were observed to maintain perfect quietness, and freedom from any possible worry or annoyance. A certain amount of sleep was obtained by chloral; opium made matters worse. The child was not put to the breast, and the lacteal secretion was easily kept under. It was, in this case, a matter of intense interest to watch the struggle for reason; for, although at no time did she exhibit symptoms of insanity, there was not the slightest doubt that she was on the verge of it; but happily, after a fortnight had elapsed, she rapidly improved, her appetite increased, and she enjoyed natural and refreshing sleep; until, ere many more days had passed, she was pronounced convalescent. It is too much to expect that this narrative proves that an impending attack of mania was warded off; but the impression is, nevertheless, fixed on the minds of those who watched the case, that constant and anxious supervision, and, above all, skilful and judicious nursing, saved the patient from a recurrence of her former malady.

The cases, however, in which preventive treatment can be expected

ment, that we may naturally inquire whether this cannot be allayed by some safer measures. The application of cold to the head, or, what is even better, laving the forehead and temples with warm water—after which there is a refreshing feeling of coolness—may produce the desired effect. In other cases, we may administer any of the vascular sedatives, of which none, probably, will be more likely to effect the purpose we require than tartar emetic, in such doses as may be necessary to produce a depressing effect—taking great care, for obvious reasons, not to push it too far. One or two drops of the tincture of aconite, or of the tincture of veratrum viride, have been recommended by Simpson for the same purpose.

Undoubtedly, the most important remedies to which we have to refer are the class of nervous sedatives. At the head of the list stands opium—the sheet-anchor, as it has been called, of the alienist physician. It is to be observed, however, that there exists a considerable diversity of opinion as to the propriety of administering opium in the puerperal varieties of insanity. It is quite certain that in some cases it proves of no avail, while in others the result is the reverse of beneficial. Simpson, who admits this, says, “Whatever may be the way in which you give the drug, remember always, as the general rule to guide you in its administration to such patients, that it must be given in very large doses. If you expect to have any good effect from it, you must give, in general, not less than two or three grains of solid opium, or an equivalent dose of some of the cognate preparations.” If unusual difficulty is encountered in the administration of the drug in the ordinary way by the mouth, the same authority recommends the introduction into the rectum of a suppository containing one or two grains of morphia; and he mentions an interesting case in which that was followed by a sleep of sixteen hours, from which the patient awakened quite free of maniacal symptoms. Dr. Tuke observes that the exhibition of opium, as well as of the other narcotics, is not beneficial when the leading symptom is acute mania; and it is well that we should bear this observation in mind as coming from one of much experience in the treatment of all forms of insanity. In some instances chloroform has been employed with much benefit, the patient being brought fully under the effect of the anæsthetic, a little more being given from time to time as she seems about to awake. Hyoscyamus, in combination with ether or ammonia, and Indian hemp, have also been employed with the same object. Camphor was Gooch’s favorite remedy, but it is not now so frequently employed as at one time it was. The hydrate of chloral is another remedy which has of late, to some extent, superseded opium in the treatment of insanity, as in many other disorders; and experience seems to show, that in this drug we have a most important addition to the materia medica of the class of diseases in question. The use of the warm bath should not be forgotten in an enumeration of sedative agents, and there can be no doubt, that by it a beneficial effect is produced even when drugs have failed. Let us always remember that the primary object which we have in view, in the exhibition of this class of remedies, is to procure sleep. If we succeed in our object, the patient may at once recover;

course, in cases which manifest this type of insanity, be no necessity for the use of any of the vascular sedatives, as the circulation is little, if at all, disturbed. From the first, therefore, we should adopt a more nutritious regimen than in the other and more frequent cases; but, unfortunately, we must look forward to a long illness and lingering convalescence, and, in some unhappy instances, to the symptoms gradually being merged in those of hopeless dementia. It will more frequently be found necessary, in the melancholic cases, to remove the patient from home, and even to place her in strict confinement.

The question of the recurrent nature of the disease is the only other point upon which we need touch; and it is one in regard to which authors do not seem to be agreed. Gooch thinks that it is unusual; but a careful observation of such meagre statistical facts as are at our command seems to point strongly to the conclusion, that there is a decided tendency to the recurrence of the disease in the subsequent pregnancies of women who have previously been the subjects of puerperal insanity. It is in cases in which there is an hereditary taint that this is most distinct, but the tendency in all cases is sufficiently marked to warrant us in taking every precaution to avoid the other exciting or predisposing causes of the disease. Tuke's cases were recurrent in the proportion of fifteen cases out of seventy-five.

CHAPTER XLII.

PUERPERAL ECLAMPSIA.

DEFINITION—CONNECTION BETWEEN ECLAMPSIA AND ACUTE BRIGHT'S DISEASE—ECLAMPSIA FROM OTHER MORBID CONDITIONS—EFFECTS OF PREGNANCY ON THE SYSTEM—PERIOD OF EXPLOSION—SYMPTOMS: PREMONITORY SIGNS; ŒDEMA, ALBUMINURIA, CEPHALALGIA, ETC.—PHENOMENA OF THE FIT: PERIOD OF TONIC AND CLONIC CONVULSIONS, AND OF COMA—PATHOLOGY: ALBUMINURIA: DECOMPOSITION OF UREA, AND FORMATION IN THE BLOOD OF CARBONATE OF AMMONIA: EFFECTS OF PRESSURE ON THE RENAL VEINS: DETECTION OF ALBUMEN IN THE URINE—MORBID ANATOMY—EFFECT OF LABOR-PAINS—MATERNAL AND FŒTAL MORTALITY—PROGNOSIS: IN ECLAMPSIA GRAVIDARUM, PARTURIENTIUM, ET PUERPERARUM—TREATMENT: PROPHYLAXIS: USE OF ACIDS: PURGATIVES AND DIURETICS: INDUCTION OF PREMATURE LABOR: TREATMENT DURING THE FIT: BLOODLETTING; CHLOROFORM; CHLORAL: OBSTETRICAL TREATMENT AT VARIOUS STAGES OF LABOR; ACCELERATION; RUPTURE OF THE MEMBRANES; USE OF THE FORCEPS.

UNDER the designation of Puerperal Eclampsia are included, not only such instances of the malady in question as are manifested during the puerperal period, but all cases, without exception, which are observed in the course of pregnancy, during labor, or after delivery. It was for this reason that we deferred any notice of Eclampsia as a com-

from these or similar causes, puerperal eclampsia may be looked upon as essentially connected with uræmic poisoning, which, again, is associated with, or dependent upon, an albuminous condition of the urine.

Before entering upon the consideration of the symptoms and pathology of this alarming disorder, it may be well to look closely, were it but for a moment, upon some of the conditions essential to the pregnant state. The constitutional sensitiveness, to which we have already more than once referred as eminently characteristic of pregnancy, can scarcely fail to display itself in its relation to the nervous system and its all-pervading influence. Dr. Barnes has quite recently¹ argued, with much force and great ingenuity, in favor of a theory which he advances, that nature provides, against the period of parturition, a special supply of nerve-force; that this is associated with an increased irritability of the nervous centres; and that it implies a corresponding organic development of the spinal cord. This involves, we apprehend, pretty much the same idea as that which we have expressed, although it is couched in more precise and more philosophic terms. What more likely, may we not infer, than that the force of a nervous system thus surcharged may, by a derangement of excited signals, be reflected upon the wrong track, and thus excite convulsive action in unlooked-for quarters, and frequently disaster as the result? This, indeed, affords a striking illustration of what has often been remarked by the most acute observers, that the more closely we study the state of the functions during pregnancy, the more are we inclined to wonder, not that functional disturbances arise, but that, in so large a preponderance of cases, there is so little apparent deviation from the normal standard. But, besides this, we cannot but regard the altered condition of the blood in pregnant women, as, in some degree, predisposing to a morbid condition, one of the essential factors of which is an abnormal state of the blood itself. These changes, as formerly mentioned, consist in an increase of water and of fibrin, a diminution in the quantity of albumen, and a reduction in the proportion of the red, with a relative increase in the white corpuscles.

There is another point of great interest, to which Barnes directs attention in his lectures above alluded to,—that all generative acts manifest an emotional and a convulsive element. “It further deserves to be noted here, that emotion takes a large part in every act or process of the generative function. In short, emotional affectability is the measure of convulsive liability. Another proposition I would state is the correlative of the preceding one. It may not be quite so obvious in its truth, but I think I shall be able to show that it is equally constant. It is this: An energy which may be compared with, if not identical in nature with, convulsion, is an essential element in the leading acts of the generative function. I have known instances of an epileptic fit being repeatedly induced by the sexual act. I have heard of several other like cases. Voisin mentions one. La Motte knew a woman who, not pregnant, always vomited *solâ actione coitûs*.”

¹ See his Lumleian Lectures on the Convulsive Diseases of Women. *Lancet*, April, 1878.

affection is intermittent. Very often the loss of sight does not come on till immediately before the fit, and cases have probably been witnessed by most practitioners of experience, in which a patient, either during labor or before it, complains of sudden and complete loss of vision, and in a few minutes, or it may be seconds, is overwhelmed with the most violent eclamptic seizure. The third of the premonitory symptoms of Chaussier, epigastric pain, is of less frequent occurrence than the other two. The suffering is described as being extremely severe, lasting often for hours; and, when it is of unusual severity, it is said to be an almost certain precursor of a convulsive attack.

The convulsive seizure characteristic of true puerperal eclampsia varies so little, save in intensity and duration, that to have witnessed and carefully observed even a single attack will suffice to make one familiar with its main diagnostic features. The following description of the fit is in a great measure borrowed from the essay already alluded to: Probably, after some of the precursory symptoms already described, the patient seems deeply absorbed and preoccupied; then her gaze becomes fixed for a few seconds, and the fit commences immediately by rapid contractions of the muscles of the face, of the eyelids, and of the eyeballs, which seem to roll in their sockets. These twitching movements, which give to the countenance a most painful expression, presently give place to tonic contractions of the same muscles, and of the neck. The mouth is first twisted towards the left, and the face is slowly turned towards the shoulder of the same side. The upturned eyeballs show, through the half-closed eyelids, the inferior segment of the sclerotic. After being slowly turned to the left, the face, by a movement in the contrary direction, turns towards the right shoulder. From the head, the convulsive phenomena rapidly extend to the other parts of the body. The extensors of the trunk, thrown into violent contraction, tend to bend the spinal column backwards (*opisthotonos*). The whole trunk becomes perfectly rigid. The limbs are equally rigid and generally extended. The hands close with force, the thumb being bent inwards upon the palm, and grasped by the other fingers. Occasionally, the predominant action of the flexor muscles has the effect of fixing the different segments of the superior extremities in a semiflexed position, so that the arm sometimes takes the attitude which is given to it to protect the head from a menaced blow. Finally, the diaphragm and the respiratory muscles become involved. Respiration is suspended; the face becomes livid; and the tongue, if projecting from the mouth at the commencement of the fit, is seized and lacerated by the spasmodic closure of the jaws, and the blood, which escapes from the wound thus produced, tinges the saliva which flows from the lips. The muscles of the larynx, and possibly those of the throat, being strongly convulsed, close these orifices. Consequently, the air, compressed by the convulsive constriction of the thorax, can only escape with great difficulty, and produces a peculiar intercepted hissing expiration. There is observed, at the same time, a complete loss of consciousness and of all sensation. The patient neither sees nor hears; and if we pinch or burn the skin, she makes no attempt to withdraw from an irritation of which she does not seem to have the slightest perception.

sia. In like manner, epileptic patients may, during labor, or at any subsequent stage, be attacked with convulsive seizures, which the previous history of the case, the occurrence of the "aura," and the absence of albuminuria, will enable us, without difficulty, to discriminate. Hysteria, too, may simulate many of the symptoms which have been detailed, but in this case also, the absence of albumen,—with a history of "globus," "clavus," or abundant urine, and an imperfect insensibility during the fits,—should prevent us from falling into serious error. But to enter upon the comparative pathology of all these affections would lead us far beyond bounds, and we must therefore content ourselves by stating, as concisely as possible, what has been established or conjectured in regard to the ordinary or uræmic variety.

That albuminuria and puerperal eclampsia are mutually dependent upon each other, or, at least, are of simultaneous occurrence in the vast majority of all cases, is an assertion not likely, in these days, to be seriously controverted. But it is by no means agreed, as to the albumen and the paroxysm, which is the cause and which the effect. According to Braun, and those who support his views, the albumen appears in the urine as the result of that inflammatory affection of the kidney commonly known as Bright's disease. As a result of this, the blood is poisoned with excrementitial elements of the urine, and especially with urea. The experiments and researches of Frerichs, alluded to in the previous chapter, have conclusively shown that the presence of urea in the blood, even in considerable quantity, does not give rise to eclampsia; and the conclusion which he has reached is, that the active poison is the carbonate of ammonia, produced, as he assumes, by the decomposition of the urea, which must, therefore, be acted upon by some particular ferment, the nature of which has yet to be discovered by the pathological chemist. Frerichs does not admit the essentially inflammatory nature of the disease; at least he appears to do so only to a limited extent, when he assumes, in explanation of the formation of the hyaline tube-casts, that the inflammatory theory can only hold good in so far as the exudation of blood-plasma is connected with a paralytic dilatation of the capillaries. Braun, however, broadly maintains that the disease is of inflammatory origin, and that the nature of the morbid process is identical with that of Bright's disease.

The other theory to which we have referred is that held by those who, while admitting the existence of albumen in the urine as an essential phenomenon, assert that this is the effect of eclampsia, and not its cause, which is, by them, supposed to be the result of some blood disease, or of some blood poison, hitherto unknown to science. Of the two theories we confess to a decided preference for the first, although we can only accept it with some reservation.

We think that Braun is too absolute in his assertion that Bright's disease is *the* cause of puerperal eclampsia. He does not, indeed, deny the existence of the anæmic and other varieties already named, but he gives the latter so little prominence that one is apt to conclude from his description—what, probably, he never intended—that their importance is so little that they scarcely merit notice. No one, obviously, can take a clear and comprehensive view of the pathology of puerperal

eclampsia, who does not freely admit that there are cases in which no uræmic poisoning exists. There is, however, we think, no impropriety, in the present state of our knowledge, in employing the term "true," as synonymous with "uræmic," in the nomenclature of puerperal eclampsia. But there is another point, in regard to which Braun seems to have carried his theory too far, or, at least, in regard to which he has failed to prove his case, viz., that all cases of albuminuria are necessarily examples of true Bright's disease. Frerichs's idea on this point seems much more likely to be correct, for, if we do not misunderstand him, he appears to say that, although fibrinous exudation and albuminous urine indicate, undoubtedly, the first stage of Bright's disease, and in that case have an inflammatory origin, it by no means follows that the same symptoms cannot, by any possibility, proceed from other than inflammatory causes.

When the uræmic theory was advanced, it was assumed as possible that, in a large proportion of cases, albuminuria and the consequent succession of pathological changes were due to pressure on the renal veins. This has been, to a certain extent, experimentally proved; and, indeed, it seems to afford the only satisfactory explanation of the rapid disappearance of all symptoms of renal disturbance upon the delivery of the woman; an issue which we could not look for with equal confidence in any other case, unconnected with pregnancy, in which an examination of the urine gave the same chemical and microscopical results. We do not for a moment mean it to be inferred that pressure on the renal veins can account for all cases. On the contrary, it is well known that the symptoms may, although very exceptionally, be developed, either early in the pregnancy or after delivery, when such pressure as is implied is obviously impossible. But we do think that the subsequent history of cases of puerperal eclampsia affords some ground for the supposition that the theory is worthy of more attention than Braun and Lever seem to have accorded to it.

The presence of albumen in the urine is shown very clearly by the ordinary tests, of which the cold nitric acid test is one of the most delicate. By this method a small portion of urine is placed in a test-tube, which, being held at an angle, while strong acid is slowly poured down the side, allows the acid to flow to the bottom. If albumen be present, and the experiment carefully performed, the contents of the tube then show three zones—the upper, clear urine; the lower, clear acid; and the intermediate zone, where the two fluids have mingled, an opaque layer of coagulated albumen. It is unnecessary to detail the various fallacies which are to be guarded against in testing for albumen, as these are now familiar to every clinical student. The observer should not forget that albumen is sometimes present intermittently, and that, therefore, a negative result by the tests is not conclusive evidence of a satisfactory discharge of the renal functions. The cylindrical tube-casts are most easily distinguished, according to Braun, if we examine the fresh urine, about an hour after it has been drawn off by the catheter, withdrawing, by means of a pipette, a few drops of the fluid from the bottom of the vessel. These casts are, however, it should be remembered, necessarily absent in alkaline urine, as they are

dissolved in the carbonate of ammonia, which is the product of decomposition of the urea. Very elaborate descriptions are given by Frerichs of the different varieties of tube-casts, but such observations belong more strictly to the pathology of a renal disease than to the explanation of a puerperal disorder. We would direct attention here, further, to two important practical points to which Braun gives a prominent position; first, "The quantity of albumen has generally an intimate relation to the extent, intensity, and duration of acute Bright's disease, but not so constantly to the violence of the eclampsia;" and again, "The more acute the Bright's disease, the darker is the urine, and the more numerous, generally, are the blood-corpuscles."

Morbid anatomy throws no very new nor clear light upon the subject. In fatal cases, which are necessarily the most severe, we would naturally expect to find evidence, more or less distinct, of Bright's disease, in one or other of its stages or forms; but this cannot fairly be held as indicating, with equal certainty, the pathology of those cases in which we venture to assume that the cause consists more in mechanical obstruction than in pathological lesion, and in which, presumably, a fatal result would be less likely to ensue. Probably the result depends, then, in a great measure, upon the extent to which the structure of the kidney has become involved; and if, in fatal cases, the hyperæmic or exudative stage has rarely been observed, we may be sure that it is because these cases usually recover. If, on the other hand, the terminal stage, or stage of atrophy, has been reached, we cannot wonder that such irremediable disorganization should culminate in a fatal result, with or without convulsions. Besides the morbid appearances which are characteristic of lesion of the kidneys, the only observations of importance which have been made are, that the lungs are constantly œdematous and sometimes emphysematous—the result, as is assumed, of the straining of the fits. The spleen is almost always enlarged, but this should not be mentioned as characteristic of the disease in question, as it is well known that enlargement of this organ is very usual, if not invariable, during pregnancy and the puerperal state, associated, probably, with some compensatory changes in the circulation.

Some have supposed that uterine contractions have an important share in the etiology of eclampsia. That the disease may be manifested during pregnancy and after delivery shows clearly enough that this is not an essential condition, even although we may admit it as a possible cause. But, in truth, uterine action is much more likely to be the effect than the cause of eclampsia; for, if there be any truth in the theory—to which some prominence has been given in previous chapters of this work—that deficient aeration of the blood is a cause of uterine action, prematurely or at the full term, we can have no difficulty in admitting that this condition exists, during the paroxysm of eclampsia, in a high degree. "By exciting pains," says Braun, "and increasing their strength, fits cannot be produced at will, nor even aggravated. For we have made the observation, that, under a high degree of reflex sensibility, convulsions cannot be induced at will, at definite periods, by violent irritation of the uterus." We do not doubt this assertion,

when the symptoms are moderate—that pregnancy is permitted to go on to its natural term ; and this alone, irrespective of toxæmic action, is apt to compromise the life of the child. In one-fourth of the cases, according to Braun, the albuminuria, or rather the uræmic or ammoniacal intoxication of the blood, is sufficient, without the occurrence of eclampsia, to induce premature labor ; but, if the convulsive disorder should be developed, the chances of mature gestation and the life of the child are still further reduced.

When rhythmical uterine contractions, and other symptoms, have indicated the commencement of labor before the manifestation of the convulsive phenomena, the effect which is produced upon that process is necessarily watched with much anxiety. In a certain number of cases, the obvious result is an acceleration in the progress of the labor, when delivery is sometimes completed with great rapidity. “The process of labor,” says Baudelocque, “in these cases, seems even more rapid than in others, as the child has often been found between the legs of the mother, although, an instant before, no disposition to delivery had been remarked.” Inasmuch as no facts have hitherto been recorded which prove that the muscular system of organic life participates in the turbulent action of the muscles of animal life, it seems more likely that the rapid expulsion in these instances is due rather to deficient resistance in the latter than to abnormal force of the former. It is quite possible, however, that the pains may, by a reflex action upon the nervous centres—surcharged, as Barnes supposes, by an excess of nervous force—excite the expulsive efforts to such an extent as to induce this result. But this is widely different, as will be observed, from a morbid supernumerary force arising from convulsive action. The result of delivery in effecting a diminution in the frequency and violence of the paroxysms is universally acknowledged, and is recognized in practice by the rule which is admitted to be of universal application,—to assist delivery as soon as the condition of the parts indicates that that stage has been reached when the passage of the child may be safely effected.

It is a matter of dispute whether the eclampsia which develops itself for the first time after delivery, is, or is not, more dangerous than the other forms. Theoretically, one would think so, seeing that, uterine excitation and pressure on the renal veins being no longer in operation, the occurrence, under such circumstances, might be held as indicating a more grave constitutional affection. But Pajot, Blot, and others, have strongly deprecated this assumption, and have stated as the result of their experience, that in these cases, the issue is on the whole more satisfactory. In those instances in which fits have come on before delivery, the completion of labor, although it usually produces a marked amelioration of the symptoms, by no means places the woman out of danger. It has been observed by Blot that, putting aside the danger of repeated attacks of eclampsia, there is in such cases a special tendency to post-partum hemorrhage ; and others have noticed that there remains a proclivity to the various inflammatory affections to which a parturient woman is liable, such as uterine phlebitis, peritonitis, pelvic cellulitis, and the like, the occurrence of which is obviously favored by the de-

In the treatment of eclampsia, in which the explosion has already taken place, our mode of procedure must necessarily differ, according to the period—pregnancy, labor, or childbed—at which the fits develop themselves. But, as regards the treatment during the paroxysm, the indications are the same in all cases, and consist mainly in doing what we can so to act upon the nervous system as to moderate central irritability, and reduce peripheral or reflex excitability to a minimum. It is but a few years since all cases of eclampsia, with the exception of the anæmic and hysterical varieties, were treated upon one and the same principle,—that being free general bloodletting. The facts, however, which modern pathology has disclosed, have completely altered the plan of treatment. Perhaps, in some quarters, the rejection of the lancet has been too absolute. Indeed, we rather incline to this belief; for there are cases in which the constitution and temperament of the woman, along with the violence of the attack, might lead us, not unnaturally, to suppose that venesection would afford the best chance of recovery. Still, it must be confessed that indiscriminate bleeding was a monstrous error, and that it would be better to do nothing at all than to bleed without selection of cases. Those who, in the present state of professional opinion, shrink most from the idea of the lancet, may, at least in suitable cases, apply leeches freely to the temples.

A remarkable effect is produced, in many cases of puerperal eclampsia, by the administration of chloroform, ether, and other anæsthetic agents—an effect which, in some instances, quite surpasses our expectations. The approach of a repeated paroxysm, or symptoms such as make us dread the commencement of a first seizure, are a sufficient warrant to adopt this method of treatment. Respiration being much impeded, as we have seen, during the fit, it is proper at that time to withhold the chloroform, so as not in any way to interfere with the function of respiration while the aeration of the blood is already so seriously interrupted. Anæsthesia, however, often has the effect of holding in subjection the premonitory symptoms, and so long as this result is undoubted, we may keep up the effect until the patient falls asleep, or the approach of stertor shows that the action of the drug can be safely pushed no further. When chloroform—which is the agent usually employed—fails to avert convulsions, it has very generally the effect of modifying them; and we may infer that, by its action on the muscles of the mouth, throat, and larynx, the danger of suffocation, during the period of tonic spasm, is materially diminished.

The hydrate of chloral is another anæsthetic agent, which has of late been strongly recommended. The sedative and narcotic effects of this drug are well known, but it is not so generally understood that when it is pushed further, it produces an anæsthetic effect, under the influence of which a woman may be delivered without experiencing the slightest suffering. We can, without hesitation, corroborate much of what has been advanced of late in regard to the marvellous effects of this drug in the treatment of convulsive diseases. When given in what we may call ordinary sedative doses,—not more than thirty grains,—its effect is safe, and in most cases efficacious; but, should we think of giving larger and repeated doses, we should bear in mind, that very alarming

What may be called the obstetrical treatment of eclampsia involves a more particular reference to the stage at which the seizure occurs. The cases in which we would be justified in inducing premature labor are very exceptional; for it must be remembered that the usual effect of eclampsia is to bring on labor, so that we need not interfere in the process. Still, there are cases where the gravity of the symptoms may call for prompt and decisive action.

In eclampsia occurring during labor, our mode of procedure must, of necessity, be regulated entirely by the stage of the process which has been reached. There are, however, two preliminary points which it is necessary to have in view throughout: 1st, that, on account of the extreme irritability of the nervous centres, we should avoid, as far as possible, all sources of reflex irritation, and, above all, any unnecessary manipulation or digital examination; and 2d, that although we recognize the importance of speedy delivery, we must be extremely careful, in adopting operative means for accelerating the process, to choose, if it be practicable, those only which are least likely to excite increased muscular action, whether of the voluntary or involuntary muscles. If the os is still closed and rigid, bloodletting is well known to have a decided, and, indeed, remarkable effect; and this, perhaps, is the stage, above all others, at which, if the other symptoms do not forbid it, we are most likely to deem that measure advisable. If not, we content ourselves with cold applications to the head, and at the same time, by means of chloroform or chloral, attempt to allay the nervous irritability while we await the result of the natural process of cervical dilatation. If the pains are inefficient, and the labor promises to be tedious, the safest method of acceleration is to introduce an elastic catheter, in the manner described in a previous chapter.

When the os is already partially dilated and dilatable, the treatment which is now recommended by almost all the best authorities, is to rupture the membranes, and, after thus permitting the escape of the waters, narrowly to observe the subsequent stages of the process. Forcible dilatation of the os (*accouchement forcé*) is a method of procedure which can scarcely be admitted as warrantable under any circumstances, and the same observation applies to the incision of the soft parts after the method recommended by Baudelocque. When the os is dilated, and the stage, consequently, has arrived at which the forceps may easily be applied, we hold the blades in readiness for immediate use; but, even here, if the parts are anatomically in a favorable condition, it is better to leave the case for a time to nature. When the head has passed downwards in the pelvis, and is pressing on the perineum, we need have little hesitation in using the instrument, should the condition seem urgent, or the labor begin to flag. The operations of turning, or of craniotomy, should never be entertained, unless in the presence of malpresentation, or pelvic disproportion, when the rules applicable to these complications must be observed. After delivery, it is advisable that the removal of the placenta should not be long delayed, and the accoucheur should pay particular attention to the contraction of the uterus and the removal of clots.

Should the convulsions persist after delivery, or should they then

been employed very loosely, to designate special groups of cases which differ from each other in many essential particulars. But, however anxious he may be to adopt a more precise nomenclature, he will find this so difficult, that he will, in all probability, as most others have done before him, abandon the attempt.

One or two of the difficulties to which we refer may here be shortly alluded to. It is admitted on all hands that puerperal fever is commonly associated with very violent inflammatory action, which may affect various tissues, the peritoneum oftenest of all. On the other hand, the peritoneum may become the seat of inflammation, apparently of local origin, running its course as it would under ordinary circumstances, the symptoms only being modified by the peculiar condition in which the woman happens to be placed. In the latter case, as we may suppose, she recovers; in the former, she dies. How far, then, it may be asked, is peritonitis an essential factor in the production of puerperal fever? or how far is the term "puerperal peritonitis" to be accepted as synonymous with "puerperal fever?" Again, we peruse accounts of two or three different epidemics of what is assumed to be puerperal fever, by men whose high reputation and recognized powers of observation are the most perfect guarantee of their good faith. Each depicts a febrile disease of the puerperal period; but the symptoms, far from harmonizing, present the most perplexing, and even startling, contrasts. Are we then painfully to collate such facts, and by describing a multiplicity of varieties, draw attention to points of contrast more than to features of resemblance? Or, finally, we find one author asserting that, under the most heroic use of the lancet, almost all his cases recovered; a second has observed that, when bloodletting was practiced, almost every case died; while a third describes, under the name of puerperal fever, an affection so trifling that it was usually checked by a single dose of Dover's powder. Are these cases really of the same nature—we ask in excusable bewilderment—or are they the same in name only? It were easy to multiply questions of this kind, which meet us on every hand, as we follow the narratives of recorded facts; but enough has been advanced to show, with sufficient clearness, the perplexing nature of the subject which we have now reached.

The more carefully one examines the whole matter, more especially if with a desire to secure a comprehensive grasp of the subject, the more apparent does it become that it is necessary to group together, under one head or generic designation, the greater number of the inflammatory and febrile affections of the puerperal state. It was this feeling, we presume, which led to the adoption by the Registrar-General of the term "Metria," under which head that functionary ranges all cases of death from the acute affections of the puerperal state. We have, however, after consideration, adopted the more familiar designation of Puerperal Fever, for reasons, and with restrictions as to its meaning, which it is now proper to explain. By adopting the singular number, and thus giving to puerperal fever the most comprehensive signification possible, we have no wish to elude the necessity which exists, if we would be intelligible, of giving to the term, if not the

admitted as an apology for admitting the intimate connection which subsists between them.

Some writers, and especially those of the French school, who have taken a similar view of the case to that which is here expressed, have gone to the other extreme in refusing to admit of local inflammations as affections which may possibly exist unconnected with true puerperal fever,—an idea which, if generally admitted, would give rise, in some cases, to unnecessary apprehension. It is from this error, indeed, we believe, that the discrepancy sprung, as to the details of symptoms and the result of treatment, which has tended, more than anything else, to veil the subject in obscurity. For, if simple local inflammation, and the more malignant forms of the fever, are held to be identical, we can readily understand how the observations of one writer, who has chanced in his experience on the less serious disorder, cannot be made to tally with those of another who has had to deal with a malignant and fatal disease. Puerperal fever, then, as embracing various disorders in themselves apparently distinct, is, in this wider sense, a term obviously open to objection. Indeed, we confess to having entertained a preference for confining that designation to its more fatal, asthenic, or typhoid type, until, on carefully reading the description given by those who have followed this plan, we recognize the utter impossibility of thus conveying in an intelligible form a correct appreciation of the different groups of symptoms, in their relation to the insidious animal poison around which the interest of the subject naturally centres.

Causes.—From a strictly philosophical point of view, it may, perhaps, be said that we know little of the causes of puerperal fever. We know, indeed, that the disease manifests itself only in women in the puerperal state. We confidently assume, that it is due to a peculiar poison, of the nature of which, in so far as chemical or other demonstration is concerned, we are profoundly ignorant. But the history of epidemics, and the valuable contributions which have, from time to time, been made to the practical elucidation of the subject, show that, since puerperal or childbed fever was first imperfectly described, upwards of a hundred and fifty years ago, many difficulties, theoretical as well as practical, have been surmounted, with the gratifying result that the mortality from this cause has of late years been very materially reduced. The progress which has been made in this direction is due, not so much to discoveries in regard to the puerperal poison, its origin, and its effects, as to the more advanced knowledge which modern hygiene has developed in regard to the laws regulating the manifestations and spread of zymotic diseases generally.

It has thus been made manifest that all epidemic and contagious diseases are more susceptible of propagation under certain circumstances. Defective ventilation, and unfavorable conditions of cleanliness, drainage, and the management of effluvia, have all been shown to encourage the advance of cholera and typhus, as well as of puerperal fever. That is to say, these conditions favor the spread of zymotic diseases once generated. The aggregation of patients in lying-in hospitals of defective construction is now recognized, only too clearly, as a cause of increased maternal mortality. And the bold and startling disclosures

at their own homes, has failed, in our own, and many other similar cases, in recognizing any such marked septic influence as Semelweiss would have us anticipate. That the cadaveric poison has, undoubtedly caused puerperal fever, is, however, quite enough to demand from every one the strictest precautions which can be devised, in order to avert so dreadful a calamity.

The above, and other similar facts, show that the poison of which we speak is associated with others of a similar nature. Attempts have, indeed, been made to prove that the poison of erysipelas is identical with that of puerperal fever; and, although it is too much to assume that this has been made out, there can be no doubt that either affection is capable of being generated from the other. But there is another consideration arising from a review of these cases,—the question of contagion; and, although there are probably few who do not admit that puerperal fever is in the highest degree contagious, the eminence and authority of some of those who have maintained a contrary view is sufficient to call for a brief notice of this point. In proof of our conclusion,—which is the general belief,—and in addition to the facts above mentioned, we may add the following from the same source. “Two medical men, brothers and partners, attended, in the space of five months, twenty cases of midwifery. Of these, fourteen were affected with puerperal fever,—a fatal result ensuing in eight cases. The only other known death from puerperal fever, in the same town, within the period named, occurred in the case of a patient attended by a medical man who had assisted at the post mortem of one of these puerperal patients. After this disastrous period, the two brothers relinquished all their midwifery engagements for one month, in which time five of their cases were attended by other practitioners, and no instance of fever occurred in the course of that month. They then returned, and several fatal cases again happened. . . . Dr. Robertson, of Manchester, relates, perhaps, one of the most cogent instances of contagion and fatality on record. In the space of one calendar month, a certain midwife attended twenty cases belonging to a lying-in charity; of these, sixteen had puerperal fever, and all died. The other midwives of the same charity, working in the same district, attended, in the same time, 380 cases, none of whom were affected with puerperal fever. In another large town, containing many thousands of inhabitants, and numerous medical men, fifty-three cases of puerperal fever occurred. Of these, no less than forty happened in the practice of one medical man and his assistant.”

If these facts do not suffice to establish beyond all question the doctrine of contagion, we would refer the reader to the works of Gooch, Routh, and Semelweiss, for evidence which appears to us to be unanswerable. Those who oppose the contagious view, attempt to account for such facts as have been quoted by exaggerating the importance of epidemic influences. That epidemic and atmospheric influences bear upon the question we do not dispute, but that these will enable us to account for such cases as have been mentioned we cannot for a moment believe. The well-known occurrence of sporadic cases has also been urged against the doctrine of contagion. It is, however, so easy to

gresses, and the swelling and tumefaction of the belly become more marked. The bowels are obstinately costive, and the patient lies on her back with her knees drawn up.

To this, if the symptoms are unchecked, succeeds a second stage, which it is impossible to distinguish from one of the most familiar forms of puerperal fever. There is now a decided change in the character of the symptoms. The pulse, although it loses nothing of its rapidity, and may even become more rapid, changes in character from the inflammatory to the asthenic type. There is a marked alteration in the countenance, a pitiful appearance of ghastly distress. The belly swells still further and becomes tense, with great aggravation of the suffering, so that the patient can now no longer bear even the pressure of the bedclothes. If the lochial discharge has not been previously arrested, it now becomes fetid, and the breasts become flaccid. The tongue is dry and often furred, and the unhappy patient suffers from excessive thirst. The violence of the vomiting in some degree subsides, but the patient is now attacked with diarrhoea, which is often violent and uncontrollable. The extremities become cold; the surface of the body is bedewed with a clammy perspiration; and low muttering delirium sets in. With these symptoms, or even at an earlier period, there is a remission or cessation of the pain, which sometimes gives rise to fallacious hopes in the mind of the patient and her friends. Hiccup, picking of the bedclothes, and delirium are the immediate precursors of death. Occasionally, a rapid metastasis of the inflammation takes place, even after an abatement of the symptoms have led us to hope that the danger had passed. The inflammatory process may thus blaze out afresh and with equal violence—in the pleura, for example; and we have known a second metastasis take place—first to one pleura, and subsequently to the other.

When a case goes on to this more advanced stage, it is difficult to say, with any approach to certainty, whether it is to be regarded as, from the first, an example of puerperal fever. Whether it be so or not seems a matter of very secondary importance, if, in the end, the symptoms of the two are identical. Nor is it of any great moment to determine where the one variety ends and the other begins. If we recognize fully the fact, that the puerperal poison may be generated from so many various sources, may we not assume it as probable—to say the least—that it may be developed in the course of an inflammatory disorder, which is so frequently its accompaniment? There is every reason to believe that peritonitis is contagious—in its second stage at least—and, if we are correct in this assumption, it can serve no good practical purpose to split hairs as to the identity or non-identity of affections which we must treat on the same principles, and in regard to which we must observe the same precautions.

When puerperal peritonitis occurs in the epidemic form, the symptoms, although essentially the same, are in every respect greatly aggravated. We may express this differently by calling it that form of puerperal fever in which peritonitis is the leading symptom. Here the symptoms are, from their earliest development, of a violent, if not of a malignant type. The pulse is, from the first, extremely rapid and

appearance of inflammation can be observed after death, the rigor is generally strongly marked. To this succeed great heat and dryness of skin, which also is often more intense than in peritonitis. I have already said that in peritoneal inflammation the surface is sometimes soft and moist from the commencement; but this I never remarked in the affection now under consideration. The pulse rises rapidly in frequency, often beating one hundred and thirty or one hundred and forty strokes in a minute; sometimes it is fluttering and tremulous; at others, fuller and firmer than in peritonitis. The mouth is generally dry; the tongue occasionally furred, or it is harsh and red. The countenance becomes early changed, though not so anxious as in peritonitis. Most severe pain in the head is experienced, with intolerance of light and noise, uninterrupted wakefulness, and, in many cases, even delirium. Very early in the disease, the abdomen swells inordinately and rapidly, becomes very tense and painful, and the transverse colon, particularly, can in many instances be distinctly traced: pressure aggravates the suffering. The milk ceases to be secreted; the lochia are generally suppressed; there is great languor; an unwillingness to speak or take nourishment; the patient lies on her back with her legs drawn up, unsollicitous about herself, her infant, or her friends; the bowels are obstinately constipated. As the disease gains ground, the belly increases in size, pain, and tightness; the tongue becomes dry and brown; there is hiccup or vomiting of offensive matter, muttering delirium, subsultus tendinum, and most of the symptoms that denote the last stage of fever; but if recovery is to be expected, the swelling and tenseness of the abdomen subside; the pain gradually goes off; the pulse becomes slower; the tongue moister; the skin cooler and softer; there is no vomiting; the intellect remains unimpaired; a desire is expressed for food, and the bowels act, together with the expulsion of a large quantity of flatus."

To distinguish between peritonitis and tympanites, in the presence of such symptoms as have just been detailed, must puzzle the most astute observers. The only points, indeed, upon which we could rely would be the history of the case; as in the former affection we would expect pain first and swelling afterwards, while, in the latter, there is an early and rapid gaseous distension, which is the cause of subsequent pain. We incline to the belief that Dr. Ramsbotham has given too much prominence to this affection as an independent puerperal disorder.

Puerperal Metritis.—This is an affection which, uncomplicated, is of much less frequent occurrence than peritonitis. Hysteritis, or Metritis, under the ordinary childbed conditions, involves the idea of an acute inflammation, attacking tissues which are the seat of a very peculiar process of involution, a part of the physiological phenomena of gestation. In a chronic form, it is by no means of unfrequent occurrence; but, under such circumstances, the result is not usually fatal. In the acute form, however, it has been observed to be very fatal, and to terminate, as in the case of peritonitis, with all the horrors of puerperal fever. In the mode of access, it does not differ materially in its symptoms from peritonitis. The pain, however, is in this case referred more particularly to the hypogastric region, where the uterus may be distinguished, of larger

form internally, either in the neighborhood of the uterus, or in distant organs, such as the lungs, liver, or kidneys,—and occasionally they are imbedded deeply in the substance of the muscles. In some cases, the eye, and more commonly the left eye, has been the seat of violent destructive inflammation. Such formations of pus, if neither violent nor extensive, may, in some fortunate instances, be looked upon as critical, and in that sense favorable; but, unfortunately, experience points to a contrary result. In the worst cases, which have been observed in various epidemics, the tendency of the inflammatory process to attack the joints has been uniformly well marked, and the fearfully rapid nature of the action, the enormous quantity of pus which is formed, and the destruction of the articular cartilages, have only too frequently been demonstrated in post-mortem examinations. Dr. Tyler Smith, in directing attention to the fact that certain tissues are selected for this destructive action, observes, that “no explanation has hitherto been given of the reason why the joints, the eyes, or the serous membranes should be especially selected. I would suggest the probability, that this selection may depend on the nourishment of parts of the eye, cartilages, and serous membranes, by the non-vascular permeation of the tissues by the liquor sanguinis, as explained by the researches of Mr. Toynbee. The diseased liquor sanguinis, or in purulent infection of the blood, the liquor puris, may easily be supposed to affect especially those tissues of the body in which special provisions exist for their permeation, by the colorless parts of the blood. One of the earliest, as well as one of the most graphic, descriptions of puerperal affections of the joints, we owe to Dr. Coulson, who has described the careful dissection of numerous cases of this kind.”

Puerperal phlebitis may extend to the proper tissue of the uterus, and also to the peritoneum, in which latter case the symptoms of peritoneal inflammation are superadded to those which more vaguely indicate inflammation of the uterine veins. It would appear that, in a certain number of fatal cases, the action is confined to the uterus—a result which may easily be explained by supposing that death had taken place before the toxæmia had time to produce its distal effects, in the production of abscess, &c. It must, however, in fairness, be conceded, that these are facts which admit of various interpretations. On this point, for example, Dr. Murphy remarks: “The morbid appearances of the veins in puerperal fever do not indicate inflammation. The uterine veins, especially in the broad ligaments, are very commonly filled with a purulent-looking fluid, but if this be wiped away, the coats of the vessel are pale, smooth, and of their natural thinness. This fluid is found spreading through a number of them; and often lies outside their coats. The uterus has sometimes been so completely infiltrated as to resemble a wet sponge more than anything else. But this is no proof of phlebitis.”

Vaginitis.—A protracted labor, in which the presenting part of the child has been allowed to remain too long in the same position, may give rise, by pressure, to very severe inflammation, and even to sloughing of the walls of the vagina. In so far as the latter form is concerned, its results have already been incidentally referred to, and consist

cess which has its seat in the Uterine Lymphatics. This was first described in France by M. Dance, and has since that time attracted the attention, both in this country and abroad, of most systematic writers. The presence of pus within the vessels of the lymphatic system has been repeatedly demonstrated; but, in so far as the symptoms are concerned, it would seem to be impossible to distinguish the affection from some others which have been described, and especially from uterine phlebitis. But, besides this, it is extremely improbable that, in the condition of the uterus at the puerperal period, angeioleucitis should be present without involving, more or less, the other tissues. And, perhaps, the converse may equally hold good,—that inflammation originating in other tissues may very readily pass to the lymphatic system.

The various affections above detailed by no means embrace all the complications which may exist along with puerperal fever, whether in the relation to it of cause or of effect. And, if we were to attempt an analysis of what may be called anomalous cases, we would but complicate still further a subject which we are specially anxious to put in as simple a light as possible. Some have placed phlegmasia dolens in this category, and in the cases in which that affection has been observed along with puerperal fever, it may well be supposed that both are the result of the same poison. It is quite obvious, however, that puerperal fever cannot be considered as a result of phlegmasia dolens; otherwise, the latter affection would be looked upon with much apprehension, instead of involving, as it does, a favorable prognosis. The general state of the system in childbed, to which we have already so frequently referred, is singularly favorable to an extension of inflammatory action which has already been commenced. It need scarcely, therefore, cost us a moment of surprise, when we find the local inflammations of the puerperal state blazing out with a violence which defies extinction, and rapidly assuming the asthenic or adynamic features, which are held to be characteristic of the most fatal form of puerperal fever.

a very accurate and full description of which was given by Malouin.¹ The mortality was so frightful, that at the Hôtel Dieu scarcely a single patient recovered. "The disease usually commenced with diarrhoea; the uterus became dry, hard, and painful: it was swollen, and the lochial discharge was irregular. The women then experienced pain in the bowels, particularly in the situation of the broad ligaments; the abdomen was tense; and to these symptoms was added headache, and sometimes cough. On the third or fourth day after delivery, the mammæ became flaccid. On opening the bodies, curdled milk (*sic*) was found on the surface of the intestines, and a milky, serous fluid in the peritoneum. A similar fluid was found in the thorax of certain women; and when the lungs were divided, they discharged a milky or putrid lymph."

During the latter half of the eighteenth century, violent epidemics appear to have occurred in most of the principal towns of Europe, and of these the history and details have, in many instances, been preserved. The lying-in hospitals of Vienna, Paris, Lyons, and London, were all in turn attacked, with results, as regards maternal mortality, too dreadful to contemplate. In the great hospital at Vienna, for example, the death-rate of all the women admitted, has reached as high as one in six. It would appear, further, that the disease, when once established in a locality, showed a tendency to return; and, with regard to Paris, Tenon observes, that "it has come to prevail more and more, and to be, as it were, naturalized." We must not suppose, however, that the mortality from this cause was only observable in the statistics of lying-in hospitals, for the disease spread by contagion as well as by epidemic influences, through all classes of society; and there can, we presume, be little doubt that the mortality was enormously increased by the obstinate incredulity of those who refused to admit that the disease was contagious. Still, it has always been upon lying-in hospitals that the great weight of mortality has fallen; and, although improvements in construction, and the greater attention which is now paid to ventilation, cleanliness, and disinfection, have greatly reduced the hospital death-rate, there is no doubt that much yet requires to be accomplished before perfection is attained, or even approached.

The statistics of the London, Dublin, Edinburgh, and Aberdeen hospitals all show that, wherever observed, the disease was a very fatal one; but if we examine into the details given of previous epidemics, we cannot fail to be struck with the fact that there has been a great variety in their nature. When we find a history of an epidemic in which the mortality has been comparatively trifling, and bloodletting has obviously been attended with a beneficial result, we may well doubt whether this should be called puerperal fever. It certainly does not rank under the malignant class. But, putting aside for the moment such doubtful epidemics, we find that when the asthenic type of the disease is perfectly marked from the outset, the local lesions vary at different times; and we thus observe that in some epidemics the peritoneum is chiefly involved, while in others the affection of the joints,

¹ Mémoires de l'Académie des Sciences, 1746.

the disease has been thoroughly established, is abdominal pain, which either originates in the hypogastric region, or, more exceptionally, in the epigastrium. The pain is excessively acute, so that the patient will frequently complain of the weight of the bedclothes; and it is soon accompanied with more or less swelling, or tumefaction,—the enlargement being due, in the first instance, to flatulent distension, and, subsequently, to fluid effusion, which is poured into the cavity of the abdomen. In some cases, the pain is associated with enlargement of the uterus, which may be recognized through the abdominal walls. This has sometimes given rise to the idea, when the general symptoms were not carefully observed, that the pain was due to those irregular contractions of the organ which are commonly known as after-pains, and, under this impression, valuable time has been lost.

As the abdominal distension increases, which often happens with extreme rapidity, the sufferings of the patient are proportionally augmented. She now lies on her back, breathing shortly, with her knees drawn up, and exhibiting on her countenance that appearance of ghastly distress which is so painful to witness. The surface and extremities now become cold; the mechanical impediments to perfect respiration cause something of lividity of the countenance; and the symptoms, becoming otherwise more grave, indicate that the period has been reached when hope may be wellnigh abandoned. At this period, the abdominal pain, tenderness, and tension often diminish; and, but for the ominous pulse and countenance, we might fancy that the patient was better. The diarrhoea continues, the stools being passed in bed; vomiting occurs, without any retching, of a dark or greenish matter; and the patient may now breathe with greater ease. The pulse is undiminished in frequency, but it is otherwise changed for the worse, as is indicated by its thready or imperceptible character. The intellect generally remains clear to the end; but in some cases low muttering delirium, subsultus tendinum, and other similar symptoms, come on before death ensues.

Such symptoms are, as will be observed, almost identical with those which have been described as characteristic of the fatal inflammatory affections previously described. If we attempt to follow the description and classification of various authors, we find that the varieties and divisions of puerperal fever are infinite, and are, were we disposed still further to classify, susceptible of more elaborate subdivision still. For our present purpose, however, it may suffice to observe, that although we believe the symptoms above detailed to be essentially those of true puerperal fever in its ordinary form, other varieties may exhibit themselves, in the experience of any man, which may differ in important particulars. But we recognize in this admission no reason for more elaborate classification of a subject which has already been classified out of all shape, and which, plastic as it is, it is difficult to mould into a simple, comprehensive and comprehensible form.

We may here advert, however, in a single word, to those cases in which the symptoms of some other specific disease precede or accompany puerperal fever. The most important of these are scarlet fever and small-pox; and when a patient in the puerperal state is unfortunate

on which it lies, as if the fibrin of disorganized blood had been deposited there. In the next degree, the same kind of lymph, or fibrin, is found, of a yellow color, with a quantity of sero-purulent fluid. And, lastly, in those cases in which the constitution for a time struggles successfully against the fever, some adhesive lymph will be met with, mixed up with a large quantity of what we have just described. You will perceive that, in protracted cases of either disease, the morbid appearances most nearly resemble each other; but that, in cases which are quickly fatal, the distinction between them is quite sufficient to enable us to separate one from the other."

Admitting the perfect accuracy of Dr. Murphy's description, as above quoted, we recognize in it no reason for modifying the opinion which has been expressed, that the fever may either, as is usual when it is directly propagated by epidemic influences—in which case the virulence, or concentration of the poison, reaches its point of greatest intensity—be primary; or it may appear subsequent to the occurrence of true peritoneal inflammation, when it may be termed secondary. Moreover, peritonitis may run a favorable course, or may even, possibly, prove fatal without having passed into puerperal fever. All those assumptions are in perfect harmony with the facts which morbid anatomy has revealed, although it may be too much to assert that they find in the latter conclusive and satisfactory proof.

The relation which inflammation of the womb bears to puerperal fever is illustrated by morbid anatomy, in a manner precisely analogous to what we have observed in the case of peritonitis. In a case of simple metritis, the chief appearances are, enlargement of the womb, with a soft and flabby condition of its substance, and increased vascularity. As a rule, the inflammatory process spreads to the peritoneum, as is evidenced by the condition of that portion of it which immediately surrounds the uterus, which is highly vascular, coated with lymph, or possibly softened. The muscular tissue of the womb has been observed, in a very considerable number of fatal cases, to be softened entirely or partially; and it has also been noticed that the most frequent seat of this and other uterine lesions is the site beneath which the placenta was attached, and next to that, the large and flabby cervix. The formation of pus is also by no means unusual; on which point Boivin and Dugès observe that "pus is sometimes found even in the substance of the womb, and generally nearer to its exterior than its interior surface. Thus pus collects into distinct abscesses, from one to five inches in diameter—sometimes into a simple or multilocular deposit, with a greenish or viscous appearance; at other times it is infiltrated into the fleshy fibres, imparting to them a reddish-yellow color, perceptible through the peritoneum. In this latter case tumors form—which are sometimes hard and projecting—upon the fundus uteri; at other times they are flattened, soft, and broad. These latter come further down towards the lateral regions, and often form a continuation, together with purulent infiltration between the laminae of the broad ligaments, with the cellular tissue of the pelvis and the substance of the ovarian ligaments." This has reference to certain secondary purulent formations which we shall have occasion to notice in

In a large proportion of these cases, swellings are observed in the neighborhood of the joints, which, on being freely incised, give exit to pus. In the worst cases pus is found within the joint itself, and the ligaments and cartilaginous surfaces afford proof of a rapidly destructive inflammation. If the eye has been affected, evidence will there be found of inflammation, of equal violence, although limited in extent. Abscess may also be found in the muscles or cellular tissue of the limbs; and, in other cases, what has been supposed to be an abscess has turned out, on examination, to be an effusion of sero-sanguineous fluid. The brain is rarely affected, but within the cavity of the chest clear evidence has often been observed of that metastasis of inflammation to which allusion has already been made, sometimes within the lungs, which have been found condensed, of a dull red color, and infiltrated with purulent matter; while at other times the violence of the disease seems to have expended itself mainly on the pleura. The heart is often enlarged and softened, and within the pericardium, lymph and serum may, with the usual alterations in the membrane itself, afford conclusive proof that inflammation has been present here also. The various portions of the intestinal canal, from the stomach to the rectum, have, in exceptional instances, been found to have been severely affected, usually by a simple extension of the inflammatory process from the contiguous position of the peritoneum. Ulceration and perforation of the stomach have been noted in some of those cases. The spleen and liver have also been found to be extensively disorganized, and their tissues the seat of single or multiple abscesses. In the greater number of the cases which were examined by Dr. Hulme, he found the omentum inflamed, and frequently black and gangrenous. In no small proportion of fatal cases, the kidneys have been found to present evidence of similar disorganization, obviously the result of violent inflammation: generally speaking, one kidney only is affected.

In the malignant variety of the fever, the following indications, in addition to those which have been already detailed, are mentioned by Dr. Copeland, in his "Dictionary of Practical Medicine." In several cases, in which bloodletting had been practiced, he observed, that "on every occasion I was struck by the peculiar faint odor, and very dark hue of the blood; by the very soft state of the clot when the blood did separate into crassamentum and serum; by the appearance which occasionally presented itself, of a mass exactly resembling, in color and consistence, a common jelly, the coloring matter covering the bottom of the vessel in the form of a precipitate; and by, in some instances, a separation only of serum, the large, loose, gelatinous crassamentum, consisting chiefly of this jelly-like matter, the lowest stratum of which contained the black or dark-brown precipitate of coloring matter. These appearances of the blood were presented in several cases in the hospital, in 1823 and three or four subsequent years, in which cases blood had been taken before I saw the patients. It may here be remarked, that I have seen many cases of this form of the disease, in which leeches had been applied to the abdomen; but in nearly all, and especially in those which occurred in the hospital, the blood which flowed from the bites did not coagulate; and great difficulty, almost

necessarily varies, according to the class to which each case belongs. If, however, we take what is at once the most simple and comprehensive view of this part of our subject, we shall find that the symptoms and morbid appearances equally disclose the fact that there are two classes of cases, presenting, respectively, the sthenic or the asthenic types, and requiring, therefore, not only different, but directly opposite methods of treatment. Nothing can well be imagined more absurd, and nothing, in fact, has been more disastrous in its results, than to manage all cases of puerperal fever—whatever meaning we may attach to the term—upon one and the same principle. One feature, indeed, is common to all cases, and consists in the contagious nature of the disease. This is the leading idea, which, more than anything else, we would impress upon the student with all the emphasis at our command. Whether the case be one of peritonitis, metritis, or malignant puerperal fever, the risk of contagion must always be borne in mind; and, although we must admit that the danger is much less in, for example, simple peritonitis, we can never be sure that it is absent, and therefore we should treat every case, without exception, as if its contagious nature were already demonstrated.

A further reference to the history of various epidemics shows, with remarkable clearness, that methods of treatment which have been found useful at one time have proved the reverse of beneficial at another. Dr. Gordon, who, in 1789, when the disease appeared in Aberdeen, saw a large number of cases, wrote, several years afterwards, a most excellent treatise on the subject, in which he drew attention, with much force of argument and illustration, to a new and successful method of practice, by means of the bold and early use of the lancet,—taking twenty or twenty-four ounces at once, and, if necessary, ten more soon afterwards. “When I took away,” he says, “only ten or twelve ounces of blood from my patient, *she always died*; but when I had the courage to take away twenty or twenty-four ounces at one bleeding, in the beginning of the disease (*i. e.*, within six or eight hours after the attack) *the patient never failed to recover*. After the bleeding, it was my practice to bring on a diarrhoea, which, when excited, I found necessary to continue through the whole course of the disease, till it was entirely conquered.” Nothing, we would say, were we reading of a new and unknown disease, can be more simple than this; nothing more clear than the indications of practice. In an epidemic which occurred in Leeds early in the present century, the treatment of Dr. Gordon was energetically adopted by Mr. Hey; and although, prior to this, every case that had come within his knowledge died, no sooner did he purge his patients, and bleed them early, to the extent of thirty, forty, and even fifty ounces, than they recovered, in the proportion of thirty cases out of thirty-three. Such facts, which were further corroborated by Armstrong, Mackintosh, and others, were held to be so significant, that for many years the treatment of epidemic and contagious puerperal diseases was, simply, heroic bloodletting.

About 1829, a remarkable essay was published by Gooch on what he terms “The Peritoneal Fevers of Lying-in Women,” which effectually staggered the belief of those who had clung most persistently to the

was produced. The success of the above treatment in the malignant form I found to be almost complete, for *scarcely a case terminated fatally* in which it was early resorted to."

It is quite clear that the stimulating treatment detailed in the above extract, and which was attended with results so satisfactory, must have been directed against a fever of a different type from that which was encountered by Gordon and Hey. The more, indeed, do we study the history of puerperal fever, the more prominently does the fact stand out that the type of the disease has varied much during the last hundred years; and that while, in one epidemic, the sthenic or inflammatory nature of the symptoms have been such as to warrant the boldest antiphlogistic treatment, in another, the asthenic type has prevailed from the first, when stimulant treatment only has been attended with success. We shall not here enter upon the question, whether or not there has been, as some have alleged, a general change in the type of all diseases from the sthenic to the asthenic form; but, admitting the force of many facts which have been advanced in support of this assertion, we confess to having entertained all along a strong impression that the idea has led to an all but invariable discontinuance of general bloodletting as a feature of modern practice, which is an exaggeration, and, as such, to some extent, an error. It is quite clear, however, that during the last forty years the type of puerperal fever has been usually, although not invariably, asthenic or adynamic.

All this leads directly to the practical conclusion that the nature of the treatment to be adopted must depend upon the type under which the disorder presents itself, and also upon the stage at which the case is brought under the notice of the physician. There is no single plan of treatment applicable alike to all cases. Indiscriminate bloodletting is as sure to lead to disaster as invariable stimulation; and it is the first duty, therefore, of the judicious practitioner to determine the nature of the individual case, and the special treatment proper to it. The cases to which bloodletting is most applicable are undoubtedly those in which the earliest symptoms indicate acute inflammation of the peritoneum, of the uterus, or, more probably still, of both. When a patient, therefore, of robust constitution, who has been exposed to contagion, complains, after a rigor, of acute hypogastric pain, which is accompanied by a rapid, incompressible pulse, throbbing temples, and suffused countenance, we should not hesitate to bleed at once, and freely, from the arm, even to the extent of twenty or twenty-four ounces as recommended by Dr. Gordon. If the thing is to be done at all, it must be done boldly; and, above all, it must be done early, for, if the patient has passed the acute stage, to bleed her is probably to hasten her doom. We have said that this treatment may be adopted in the case of a woman who has been exposed to contagion, but it is not to be assumed that bloodletting is necessarily confined to such cases. The words are inserted rather as a precaution, lest inexperience should rashly adopt an heroic treatment in such cases as acute tympanites, or even in severe after-pains, when the pulse often rises. Clear evidence of acute inflammatory action is the safest and indeed the only test. It is to be remembered, however, that cases do occur in which the symptoms are such as

almonds, syrup of marsh mallow, and Kermes's mineral. At one time, calomel was given very freely in those cases, and, on the whole, as it would appear, with benefit. On this point Gooch observes, "I have never given it systematically in a number of cases, but what experience I have is in its favor. In the Westminster Lying-in Hospital, where ten or twenty grains of calomel used to be given every day, with purgatives, the gums sometimes were affected, and these patients invariably recovered." The fact of all those recovering where the gums were affected may, however, be otherwise explained, on the supposition that if they live long enough for mercury to produce its constitutional effect, the urgent danger of the case has necessarily, in some measure, passed. It will generally be found advantageous to combine opium with the mercury, but, in this respect, much will depend upon the stage which the disease has reached. Spirits of turpentine was at one time highly recommended in the treatment of puerperal fever, but the effects produced by its internal administration seem to have been somewhat exaggerated. Flatulent distension of the bowels is, however, so frequent a complication that we would naturally anticipate some benefit from this drug, although, perhaps, it would be more correctly described as a palliative.

Blisters to the abdomen have been thoroughly tried, but without any very satisfactory result. Among modern authorities, Dr. Churchill seems, however, to retain some belief in their efficacy, and says that, from the cases he has seen, he is "inclined to think blistering useful, and it affords an opportunity of applying mercurial ointment to a highly absorbent surface." Iodine has also been suggested, but the external applications which find most favor are either warm poultices or turpentine fomentations.

The asthenic character which has been so generally observed in the more recent epidemics has led many, whose experience has been confined to cases of this type, to discard all treatment in favor of a stimulant and tonic regimen from the first. Dr. John Clarke gave bark in powder and decoction, with opium and wine. M. Beau found great benefit in the use of quinine in doses of fifteen to thirty grains in the day. These facts, however, afford only further illustrations of what we have repeatedly urged, as the foundation of all rational treatment, that it must be adapted to the type of the disease.

The question of prophylactic treatment, which naturally suggests itself here, is second in importance to no point relative to our subject. The rules of lying-in institutions are generally framed with the view of prohibiting students who are engaged in the dissecting-room from the practice of midwifery, or, at least, point to the strictest precautions being observed. The danger, however, is much greater for those who are engaged as dressers in hospitals where there is erysipelas or hospital gangrene. Improved ventilation has proved in hospitals an invaluable check on the ravages of the epidemic disease; and there is good reason to believe that in some instances neglect of proper drainage has led to an aggravation of the type. The case of the General Lying-in Hospital, which was built on the marshy land by the Thames, affords an illustration of this, as after proper drainage the mortality in that institution

the disorders which we are about to describe and puerperal fever is, in some cases, direct and unmistakable; but, in the great majority of instances, the disease, although inflammatory in its nature, has no such intimate relation to puerperal fever as to admit of its being placed in the same category. For these and other reasons, it is thought better to consider the group of affections to which we have referred as separate from, although associated with, those previously described.

In most systematic works, even by those whose merit is universally recognized, these affections are dismissed with a brief notice, and under a great variety of names. The first difficulty, therefore, which we encounter is in the matter of nomenclature—*Pelvi-peritonitis*, *pelvic cellulitis*, *subperitoneal inflammation*, *peri-uterine phlegmon*, *perimetritis*, *parametritis*, and *inflammation of the uterine appendages*, are only a few of the many designations under which this group of affections have been described; which may be most usefully considered together, for purposes of analysis and such description as is here possible. A very brief preliminary definition of the various terms above employed is, however, essential.

What was originally described by M. Nonat as *peri-uterine phlegmon*, is better known to English readers under the more familiar designation of *pelvic cellulitis*, with which we may assume it to be almost synonymous. The idea involved is an inflammatory affection, tending to the formation of abscess, which has its seat in the cellular tissue between the uterus and peritoneum, or in some other part of the same tissue within the pelvis. Both expressions are unfortunate, and involve a fundamental error. *Subperitoneal inflammation* is another synonym equally objectionable. That *inflammation of the uterine appendages* is very commonly associated with the class of affections which we shall describe is universally admitted, but if used as a comprehensive designation, as Churchill has employed it, it may be supposed—and if so very erroneously—to be confined to these tissues.

Dr. Matthews Duncan, who has treated the subject in his well-known work at considerable length, and with his usual ability, adopts the words *parametritis* and *perimetritis*, borrowing the idea of this nomenclature, as he tells us, from Virchow, who, taking example from the heart and other organs, purposes to use *peri* to signify inflammation of serous membrane, and *para* to imply inflammation of cellular or connective tissue. “Perimetritis, then,” he adds, “will strictly imply inflammation of the uterine peritoneum. Parametritis will imply inflammation of the cellular tissue in connection with the uterus. Similar terms may be found for the Fallopian tubes, *perisalpingitis* and *parasalpingitis*, and likewise for the ovaries. But I shall seldom have occasion to resort to them. In the present imperfect state of our diagnostic resources, it would be mere pedantry to do so frequently. There are only a few cases in which we can assert, during life, at least, that the pelvic peritonitis is perisalpingitis, or perioophoritis, or that the pelvic cellulitis is parametritis, parasalpingitis, or paraoophoritis. To hide our ignorance on this point, it would be convenient if we had a rough word expressing the internal genital organs, to which to prefix the adverbs ‘peri’ and ‘para.’ But we have not such a word, and

symptoms of inflammation of the uterine appendages are almost always very obscure. When the pain is circumscribed by limited peritoneal inflammation, its site in the iliac fossa, or lateral region of the hypogaster, may be held to indicate a probability that the structures in question are affected; but there are no reliable means for determining whether the morbid action is limited to the peritoneum and subjacent tissue, or extends more deeply so as to involve the deepseated structures of the tube, or ovary.

The diagnosis of these and the other allied affections depends, in a great measure, upon the results of abdominal palpation and vaginal examination; and, from the many fallacies which may spring in the course of such an investigation, it may be added, that upon the special experience of the examiner the accuracy of any opinion which may be formed will greatly depend. Dr. Matthews Duncan directs attention, at considerable length, and with much propriety, to the loose manner in which the expressions, "fulness," "hardness," and "tumor," are employed in the narratives which we read of such cases; and it is quite clear, although the words themselves are sufficiently explicit and significant, that much confusion arises from this source, especially, perhaps, in confounding tumor with mere hardness. The same remark applies to any investigation which may be made from the vagina; and it is, in every case, of the highest importance that we should determine if any connection exists between an enlargement observable from above and one which is made out from below. In the case of a solid tumor, free from serious adhesions, this is very readily recognized by such method of investigation,—the impulse communicated from one direction being readily transmitted to the other. If it be a cyst or abscess, fluctuation is thus sometimes distinguished, without any difficulty, between the two hands, which are simultaneously employed in the examination. But, in the case of mere diffused fulness, or hardness, or a tumor which is bound down by adhesions, the difficulty of diagnosis is increased, to an extent which is only fully recognized by those who have devoted most attention to such matters.

Pelvic cellulitis, peri-uterine phlegmon, or parametritis,—and accepting those expressions as synonymous,—indicates, as already stated, an inflammation of the subperitoneal cellular tissue, possibly radiating thence, and always involving a tendency to the formation of abscess. Until within a comparatively recent period, every mysterious tumor or enlargement following delivery, was, without much hesitation, referred to this category. Recent investigation seems, however, to assign to it a much less important position. To no one is modern science more indebted, in reference to this subject, than to M. Bernutz; but there can be little doubt that that experienced and able observer undertook to prove too much, when he thrust aside pelvic cellulitis,—merely admitting the possibility of its existence,—to make room for his own idea of pelvi-peritonitis. It is a dangerous thing to prove too much, inasmuch as anything approaching to exaggeration is apt to attach discredit, even to investigations which are otherwise of the highest importance. But, freed from this blemish, no impartial critic can deny that M. Bernutz has rendered to this particular department of science the most

mation of the ovaries or Fallopian tubes. Thus great interest attaches to the study of this affection; and it is very important thoroughly to understand the symptoms, in order to describe satisfactorily the uterine, and more especially the tubo-ovarian diseases which occasion it." By pelvi-peritonitis, then, we understand an affection which is essentially a secondary or symptomatic one,—the inflammation originating, according to Bernutz, in the uterus, tubes, or ovaries, and extending thence to their peritoneal investment. It is difficult to understand how the disease can spread in this manner without involving the intermediate cellular tissue, but the difficulty is very simply solved by Bernutz, by the denial that any such tissue exists over the uterus, except at the site already alluded to between the layers of the broad ligament. That this is the case we very much doubt, for, although it may be extremely thin, all analogy would lead us confidently to expect that a trace at least of cellular tissue must there be discoverable. That the peritoneal affection in these cases is secondary to inflammation of the subjacent organs is a fact which, in regard at least to the majority of cases, he has succeeded in establishing; but we do not think that he is warranted in assuming that pelvi-peritonitis can be produced in no other way. In some cases, the result has been the formation of cysts in the peritoneum, which are circumscribed by the inflammatory process, and may contain a purulent or muco-purulent fluid. In others, the tumor—the nature of which during life it had been impossible to determine—was discovered, on post-mortem examination, to consist of a mass of viscera matted together by adhesions, usually involving the tube and ovary with contiguous portions of the bowels. The diagnosis of this latter class of tumors is particularly difficult, as the structure of the mass is such as to render almost useless the valuable information which we obtain in other cases from fluctuation and percussion. Another point of importance, in reference to such cases, is the possibility of a mechanical obstruction to the function of that part of the bowel which is involved.

In a case seen recently with Dr. Moore, this appeared to us to be the cause of the severity and alarming nature of the symptoms. The patient had been confined about a month previously, and being out for her first drive, she imprudently got out of the carriage and sat for a short time on a bench in an exposed part of the park. On her return home she felt unwell. The following day acute pain was complained of in the left side above the groin, and the symptoms generally went on increasing in severity, while a tumor became developed in the region referred to. This tumor was irregular in shape and indistinct in outline, but, being exquisitely tender, it was difficult to make a satisfactory examination of it, further than that it was manifestly connected with a corresponding fulness which was easily recognized from the vagina. It was with the greatest difficulty that the action of the bowels was maintained; the tympanitic distension was enormous; and for some days the occurrence of obstinate vomiting prevented the administration of any remedies, or almost of any food by the mouth. Considerable benefit was derived from the use of suppositories containing tar, but it was on several occasions found necessary to give egress to the pent-up

between pelvi-peritonitis and the familiar pelvic cellulitis of most writers. The majority of all pelvic abscesses, occurring at the period of which we speak, are probably due to the latter affection; but some of our most able gynecologists—Dr. Matthews Duncan, for example—hold a contrary opinion, and believe that intra-peritoneal purulent collections form the majority of grave abscesses in this situation. Supposing it to be admitted that the idea generally entertained as to the origination of pelvic cellulitis within the folds of the broad ligament is well founded, an interesting subject of investigation is thus suggested. Nor can we wonder that numerous dissections have been made, and experiments by injection or inflation of the cellular tissue performed, with the view of determining what direction an abscess in this particular situation is likely to take. The question is, however, far from solved, and we certainly find abscesses taking quite unexpected directions. “The most frequent extension of parametric abscesses,” writes Matthews Duncan, “is either upwards, or into the iliac fossa on either side. But they may go much further. They may extend along the rectum to the perineum. They may extend to the kidney. They may, in assuming these directions, attack only cellular tissue, or, in addition, may lead to destruction of muscles, as of the psoas and iliacus. I have dissected such abscesses in the puerperal state, and in connection with non-puerperal disease, extending from the kidney to the uterus.”

One of the most important practical points connected with these abscesses, whether they be parametric or perimetric, is the method to be employed for the detection of pus. Every clinical student is taught that fluctuation is the most reliable sign of the presence of fluid within a cavity which it fills, and is instructed how to apply the test, the manipulation being somewhat varied according as the accumulation is large as in ascites, or small as in an ordinary superficial abscess. In this strict sense, however, fluctuation is very rarely available in the diagnosis of pelvic abscess, for the obvious reason that while we require, to produce real fluctuation and at the same time to appreciate it, two hands, as a rule, in the investigation of these tumors, one hand, or it may be one finger, only is available. The circumstances under which actual fluctuation is then discoverable are to be found in those cases only in which the tumor has reached above the pelvic brim in the direction of the iliac fossa or elsewhere, or when it is possible to produce the wave of fluctuation between the fingers in the vagina and the other hand applied to the abdominal wall. The presence of fluid may, however, often be recognized quite easily by the finger in the vagina; but there are many cases in which to be certain requires a high degree of the *tactus eruditus*. “This is, however,” as Dr. Duncan observes, “not feeling fluctuation. It is merely the educated finger picking up such sensations as enable the mind to perceive a collection of fluid in a cyst or bag. The finger cannot both produce fluctuation and feel the shock of the wave.”

Treatment.—The management of pelvic cellulitis and pelvi-peritonitis depends, in the first place, and very obviously, upon the nature of the case. It will depend, moreover, upon whether the symptoms are acute or chronic; whether the disease is progressive or stationary;

stances would warrant such a measure. It is otherwise, however, as regards leeching, from which, in some instances, very marked and decided benefit may be anticipated. Leeches may be applied to the groins, the perineum, or the uterus; and although blood drawn from any of these situations may be productive of excellent results, it is obvious that the direct abstraction of blood from the uterus—more especially if that organ is involved, primarily or secondarily, in the morbid action—is the procedure from which we may anticipate the most marked effect. But if the nature of the case be such that it is impossible to introduce the speculum, the leeches may be applied to the vulva, taking care that they do not bite too high; for it has happened that very troublesome bleeding has been the result of the application of leeches to the vagina, from the difficulty of reaching and controlling the bleeding point. “I believe,” says Bernutz, “that four leeches applied to the cervix are as good as three times that number applied externally; for not only is it nearest to the seat of inflammation, but the relief to all the genital organs is greater. I do not think even scarification can be compared with leeches, in point of utility; the amount of blood drawn off is, comparatively speaking, quite insignificant; and there is the possibility of serious consequences resulting.”

It is never necessary to apply more than three leeches at a time to the os and cervix, for if the quantity of blood which is withdrawn should not be deemed sufficient, the flow may be encouraged by a warm hip-bath, by means of which the quantity may often be regulated at will. As a rule, it is not advisable to aim at the abstraction of a large quantity of blood, as a very moderate discharge is all that is necessary thoroughly to deplete an organ of the size of the womb; but besides this there is the danger of interfering with the menstrual function, should we push depletion too far—more especially if the period be at hand. In the actual application of the leeches, some nicety of manipulation is sometimes required to prevent them from crawling round the edge of the speculum, when they will probably fix upon the vagina, or even pass out by the vulva; and, as it has happened that disagreeable symptoms have resulted from the leech making its way into the uterus, it is recommended in pluriparæ, or in any case where the aperture is large, to put a small plug of wool in the gaping os. It is to the acute stage, mainly, of the cases of pelvi-peritonitis, in which the uterus, or its appendages, are assumed to be the original seat of the disorder, that leeching is applicable; but there are, undoubtedly, cases of cellulitis in which congestion of the womb exists as a complication, where the treatment is precisely similar. And at any stage of the more chronic forms, an exacerbation of the symptoms may present such features as clearly to call for local depletion. In the present state of our knowledge it will not do to pause in these cases until our diagnosis is complete. The indications which point to bloodletting as the proper remedy at the time being clear, it is a very secondary matter to determine whether the peritoneum or the cellular tissue is the part involved.

Poultices, fomentations, hip-baths, and the vaginal douche, are

remembered that, while the danger of premature operation is admitted, the greater danger of rupture of the sac and escape of its contents into the peritoneal cavity must not be overlooked. Some have said that such an abscess should be opened *when it threatens to burst into the peritoneum*; but in what this threatening consists, or how we are to recognize the danger, is what no one has attempted to show. If the abscess is acute in its history and progress, it is better to leave the operation to nature; but, if it is mature and chronic, and shows no tendency to point externally, it comes to be a very delicate matter to determine whether we shall operate or not. If we dread its opening into the peritoneum, we must at the same time bear in mind what the experience of West, Bernutz, Aran, and others has clearly shown,—that, even if we open an abscess, this does not prevent its subsequent perforation into the peritoneal cavity. If the symptoms of hectic fever manifest themselves, or if the tumor gives rise to great suffering, the idea of operation will naturally receive encouragement; but, in the absence of these conditions, it is always better to wait. Pelvic abscesses may point at various situations externally, which are well known to the surgeon, or they may only be reached through the vagina, or even by the rectum; but, in any case, when the operation is resolved upon, the opening should be free, so as to admit of a thorough evacuation of the cyst. “Old pelvic abscesses,” Dr. Duncan observes, “demand even boldness in operating. . . . I have repeatedly operated in cases where I knew the abscesses were several years old; and in such cases sometimes more than once; and I have never had reason to doubt the propriety of the treatment.”

There is another class of pelvic tumors, the nature of which was recognized by Ruysch in 1691, but which has received very little attention except at the hands of quite modern gynæcologists. These are the sanguineous tumors—the result not unfrequently of menstrual accumulation outside of the uterus—to which the name of Peri-uterine Hæmatocele has been given. This question is too complicated to enter upon here, and, indeed, there is only one section of it—the intra-pelvic hemorrhage occurring in extra-uterine pregnancies—which comes strictly within the scope of our subject. These tumors are merely mentioned at this place, as they might possibly give rise to difficulties in the diagnosis of the affection which we have just been considering.

Twenty years ago, no one could presume to write a treatise on Midwifery without an elaborate disquisition on the subject of Anæsthesia. The then recent discovery of chloroform and of the anæsthetic power of sulphuric ether was an era in the history of surgery; and we cannot wonder that the obstetrician should have claimed for his art the immunity from pain and the other advantages of which his surgical brethren were so gratefully availing themselves. We look back to this period (*circa* 1848), and turn over the pages of the pamphlets which mark the bitterness of the controversy which was then being waged, with a feeling partly of amusement and partly of humiliation. The theological tone which was prevalent in some quarters is the most extraordinary feature in the whole affair; but how sensible and able men

fibres of the respiratory nerves are affected, and stertor indicates that *Ultima Thule* of safety has been reached.

The disadvantages of chloroform in the practice of obstetrics are, in the first place, the tendency to vomiting, which is so apt to be produced in the course of its administration. For obvious reasons, however, the stomach rarely contains much food at the period of delivery, and this is no doubt the reason why vomiting is, in midwifery, when chloroform is used, comparatively rare. Still, it does occur; and, more than that, it occasionally persists for a considerable time, to the manifest disturbance of the patient during the post-partum period. Partly on this account, and partly, it may be, in consequence of the effect which is produced on the nervous centres, it has been pretty clearly established that the indiscriminate use of chloroform, or other anæsthetics, predisposes to hemorrhage after delivery. Another objection which has been stated is perhaps of less importance,—that in operations, the annihilation of sensation removes what was before a reliable safeguard, as, for example, when the blades of the forceps are applied, the patient is no longer conscious of the pain caused by including a portion of the vaginal mucous membrane in the lock—the suffering produced by which would previously have caused her to cry out.

The question of anæsthetics seems to us to stand thus. In eclampsia, in some cases of mania, and in all cases of operative midwifery, it is, without exaggeration, invaluable. In ordinary cases, it is always to be used with caution, but if employed in small quantities on a handkerchief on the approach of each pain, towards the termination of the second stage, it can never do harm. It thus allays pain and assuages nervous irritability; and, in the hand of the skilful practitioner, it is a power for good and never for evil.

APPENDIX.

THE BIPARIETAL OBLIQUITY OF NAEGELE.

FOR reasons which have already been stated, but chiefly with the view of avoiding controversial matters in the text, I have thought it better to express, in the form of an appendix, the reasons which have led me to reject the theory of biparietal obliquity as an element in the mechanism of parturition. The following observations, with some modifications, are mainly taken from my work on the "Mechanism of Parturition," published in 1864. The error of Naegele is certainly not so commonly taught as it once was, and many distinguished teachers and writers have completely abandoned it; but the fact of its still being a matter of common belief, together with the respect which is due to any doctrine having the stamp of the authority of the distinguished Professor of Heidelberg, makes it both necessary and fitting to analyze the subject with some care. But, as some doubt has occasionally arisen in regard to the exact nature of Naegele's views, it will be proper first to make sure what his opinions were before proceeding to refute them.

In his celebrated essay, originally published in *Meckel's Archiv*, Naegele describes, in addition to the pelvic and occipito-frontal obliquities, a third obliquity, the *biparietal*. He maintained, therefore, that, in regard to its transverse measurement, the head entered the brim obliquely, "so that the greatest breadth of the skull (from one *tuber parietale* to the other), as also the breadth of its base, never in its passage, under ordinary circumstances, coincides with the diameter of the brim." On this point he says also, in describing the first position :

"The head has not at the brim a direct but a perfectly oblique position, so that the point which lies lowest or deepest is neither the vertex nor the sagittal suture, but the right parietal bone. The sagittal suture is nearer to the promontory of the sacrum than to the pubis, and divides the *os uteri*, which is directed backwards, and generally somewhat to the left, into two very unequal parts. . . . The higher the head is, the more does its long diameter approach the transverse of the brim, and the more oblique is its position, on account of which the right ear can generally be felt without difficulty behind the pubis, which would not be the case if the head had a perpendicular direction."

These extracts leave no room for doubt that his meaning was really a lateral flexion of the head, an approximation of the ear to the corresponding shoulder. He also describes, but in terms which, being somewhat vague, have led to some misapprehension, that there is a biparietal obliquity at the outlet; but in this he is, as has been observed in the chapter on the "Mechanism of Parturition," quite correct. The following obser-

dicular, but a perfectly oblique position (*keine gerade, sondern eine ganz schiefe Stellung*), so that the part which is situated lowest or deepest is neither the vertex nor the sagittal suture, but the right parietal bone."

I repeat that the fact thus stated in general terms is incontestable, inasmuch as it obviously refers to the axis of the cavity; but Naegele goes beyond this, and pushes his conclusions much further than the facts of the case warrant, when he says that the sagittal suture is nearer the promontory of the sacrum than the symphysis pubis, and that the biparietal measurement can *never* during labor coincide with the plane of the pelvic entrance. I may mention here that, although I began my study of the subject with a firm conviction that Naegele was right in this particular, I have been step by step driven to the conclusion that he is perfectly wrong. It is perhaps unnecessary to say that the view which I take of the position of the head at the brim is, albeit somewhat heterodox, far from original. Nor is the doctrine without powerful supporters, as this is the view entertained and clearly expressed by Velpeau and Cazeaux in France, and more recently in this country by Dr. Matthews Duncan; and several other observers, among whom I may mention Drs. West and Paterson,¹ have arrived independently at the same conclusion, which they have expressed in a more cursory but not less decided manner. M. Cazeaux expresses it as follows:

"Avant la rupture de la poche des eaux, la tête du fœtus est légèrement fléchie sur le devant de la poitrine, et les rapports des diamètres de la tête avec les diamètres du détroit supérieur sont les suivants; le diamètre occipito-frontal est parallèle au diamètre oblique gauche du détroit supérieur; le diamètre bipariétal est parallèle au diamètre oblique droit; la circonférence occipito-frontal de la tête est parallèle au pourtour du détroit supérieur; l'axe de ce détroit supérieur passe par le diamètre trachélo-bregmatique."

The arguments of Naegele on this point are stated, as indeed all his views are, with great clearness and precision, and are, I admit, apparently conclusive and convincing. But I do not despair of being able to show that he has been led into error, if my readers will only deign to put aside for a time a preconceived opinion and study the subject in nature. I may fail in any argumentative attempt to show that Naegele was wrong, or I may be met with reasoning more subtle than my own; but I would only ask that, as my arguments are founded upon practical research, those who would refute them should test the matter fairly—a task which will involve some labor, but which is within the power of every practitioner in midwifery.

In admitting the general accuracy of most of Naegele's descriptions, I assume that the fundamental error from which, more than any other, his mistake arose, was ignorance, at the time he wrote his essay, on the subject of the great obliquity of the brim in respect to the horizon. There must, I think, have been remaining in his mind some remnant of the old idea of the *horizontal* brim; for it must be remembered that his attention was not directed to the subject of the relation which the pelvis bears to the trunk and limbs, until some years after the date of the publication of his paper on the mechanism of parturition. If the brim were indeed parallel to the horizon, or nearly so, the fact of the finger meeting the parietal bone in the vicinity of its tuber would be clear and irrefragable evidence of the so-called lateral or biparietal obliquity of the head. But if we do not allow ourselves to lose sight of the fact that the brim is inclined at an angle of 60°, and that the vertex or presenting part passes downwards and backwards so

¹ Glasgow Medical Journal, October, 1862.

obliquely as to meet the horizon at an angle of 30° —even admitting that the right parietal bone in the vicinity of its tuber is the lowest part in the pelvis—I cannot see how this is to be accepted as evidence of anything else than that the head is advancing directly in the axis of the brim, but very obliquely with regard to the cavity, and still more so with reference to the horizon, as is shown in Fig. 182.

If to this great and admitted obliquity we superadd that which, according to Naegele, separates the sagittal suture from the axis of the brim, so as to bring the middle part of the suture opposite the fourth division of the sacrum, "whether," says the younger Naegele, "the head stands deeper

FIG. 182.

D

Fig. 182 shows the great amount of lateral obliquity (quâ the horizon) of the head advancing in the axis of the brim, the centre of the sagittal suture being, although much nearer *the sacrum*, exactly midway between the promontory of that bone and the symphysis pubis. It shows also how, during the whole of this stage of labor, the right tuber parietale may be described, in general terms, as the part which first meets the finger, or as lowest in the pelvis, advancing as it does in the direction of the dotted line parallel to the axis of the brim. If the head were in the transverse position, the sinking of the tuber parietale would be still more decided, but in that case it would be slightly to the left of the middle line.

A B. The plane of the brim meeting the horizon at an angle of 60° at A.

C D. The axis of the brim passing through the centre of the sagittal suture and the coccyx, and meeting the horizon at D at an angle of 30° .

or shallower," we must first believe that the trachelo-bregmatic measurement is as nearly as possible parallel to the horizon.

The first difficulty which shook my conviction in the accuracy of Naegele's statement was here encountered. Granting for the moment that his description is correct, let any one take a foetal skull and place it in the dried pelvis in such a position that the vertex is approaching its floor, with the sagittal suture directed as above described, when he will find—and there is, I think, no avoiding this conclusion—that the ear could in all circumstances be felt with the greatest ease; and yet we all know that it is almost always a matter of considerable difficulty to reach the ear at this stage, even more so indeed than when the head is situated higher. This difficulty has not by any means been overlooked by Naegele; but having adopted one fundamental error, he makes this the standard by which he gauges deviations from his theory, and thus is inevitably led further astray. He explains it thus: "The higher the head is, the more oblique is its direction,

for which reason the ear can generally be felt behind the pubis without difficulty, *which would not be the case if the head had a straight direction.*"

I admit that on the first blush this argument has a significance, which it does not, however, maintain on closer examination. In the first place, he commits himself to the opinion that this alleged obliquity has no reference to the resistance which the head experiences from the pelvis, inasmuch as it is greater before this resistance can have come into play. He then goes on to assume that the fact of the ear being felt behind the pubis at an early stage of labor, is a proof of this obliquity. With reference to this point, I would remark that he seems to me, throughout his whole essay, to put too much weight on the facility with which the ear may be felt at the beginning of labor. That it may in many cases be so felt is an undoubted fact; but as far as my experience goes, I have in the great majority of cases found it no such easy matter to reach the ear, in any stage of labor, as Naegele would have us believe. When I can so reach it, it only proves to me, what Naegele himself admits, that the head approaches the transverse diameter more than usual. For it must be remembered that the upper part of the pubic symphysis is within easy reach of the outlet, and that, on account of the inclination of the brim, when the ear moves to the side it moves at the same time *upwards* along the ilio-pectineal line, and consequently further from the finger. This then is a mere assertion of Naegele's; his proofs are in no degree incompatible with the idea of a direct entrance of the head. I am quite willing to admit that in some extreme cases in which the ear is felt with unusual ease, as well as on other rare occasions, there may be some exceptional obliquity; but I am perfectly convinced that this is the exception, and the direct entrance the general rule. But there are other arguments familiar to every obstetrician which must be met, and if possible, refuted.

"The sagittal suture," says Naegele, "divides the os uteri, *which projects backwards and generally somewhat to the left*, across into two very unequal segments." Mark how ingeniously he argues from a preconceived opinion, and trims his facts to suit his theory. We may allow the alleged inequality of the segments in the meantime to pass; but as this is quite insufficient to account for the amount of obliquity which he describes, he maintains that the os is displaced in the very directions which suit his argument, viz., backwards and to the left. For it will be observed, on a reference to Fig. 180, that the effect of a slight displacement to the left is, in the direct position at the brim, to throw the small segment forwards, and it will be understood at a glance that the further effect of a displacement backwards would be to leave the sagittal suture concealed by the anterior lip of the os; whereas, by bending the head towards the left shoulder, his theory restores the relative positions of os and suture. This is the flimsiest of all his arguments, inasmuch as it is purely theoretical, and depends entirely for its accuracy on the correctness of his original statement in regard to the obliquity. The difficulties in determining the relations of the os during labor are very great; but taking, as I do, the fact of the sagittal suture crossing the os at the beginning of labor as evidence of the direct entrance of the head, I see no reason to doubt that the centre of the os corresponds pretty nearly to the axis of the brim. I even doubt the general accuracy of the assertion that the smaller segment is behind, and I have certainly, at an early stage of labor, found it to vary considerably in this respect. Dr. Paterson, who, although admitting this fact, is nevertheless convinced that the head enters the brim directly, attempts to account for it by supposing that the os is displaced forwards; but I rather think that he has no more proof to offer

is to be found at the right parietal bone. I have already alluded to the theory advanced by Dr. Paterson, that the os is inclined forwards, which would, if correct, afford a most satisfactory explanation of the phenomena as detailed above. Proof of its accuracy is, however, wanting, and indeed the difficulties which an examination offers are such that we cannot hope for a strict demonstration of the fact, even if true, unless we were to argue from the assumed fact that the entrance of the head was direct, and thus adopt the very error in reasoning which has led Naegele astray.

The theory by which Dr. Matthews Duncan attempts to account for this, demands a separate consideration. This able writer is of opinion, that it is a mistake to suppose that the thickest or most prominent part of the swelling corresponds to the centre of the area upon which it has been formed, but that this is to be found in the direction in which the least resistance is offered to its formation. Applying this argument to the formation of the swelling in this stage, he says:

“The caput succedaneum of the first stage of labor is often formed after the head has passed the brim of the pelvis, and is lodged in the upper half of the cavity of the bony pelvis. Were we to be cautious and exact in reasoning, all such swellings should be excluded from the argument, for evident reasons. It is only those formed at the plane of the brim, or very near it, that can, under any circumstances, afford assistance in settling this question: under the actual deficiencies of exact data, we must be content with stating principles. Now, it is evident that the direction of the caput succedaneum of the first stage will be that of least resistance—that is, the direction of the axis of the undilated vagina; in other words, the caput will be thickest when the head is least supported, and may, in other parts within the centre of the os uteri, be so inconsiderable as not to attract notice. Further, and for the same reason, the centre of the caput succedaneum, or the centre of the os uteri, will not correspond with the thickest portion of the swelling, but in this case be behind it, or near the left parietal bone. The oblique direction downwards and forwards of the vagina will lead the caput in that direction, and the support given by the posterior wall of the vagina to the posterior half of the space inclosed in the circle of the os uteri will cause thickness of the swelling over the right, and comparative thinness over the left parietal bone, and displacement of the thickest portion of it forward in the pelvis, that is, in the direction of the right parietal and away from the left parietal bone.”

This theory is extremely ingenious, and affords to me the only explanation of the facts described by Naegele, which gives a rational and satisfactory solution of the problem, in conformity with the phenomena which I myself have observed. For its absolute accuracy I cannot vouch; but I cannot help thinking that it is in the main correct, or at least that it points out the direction in which we are to search for truth.

My last argument is one which, while of itself it goes for nothing, is at least admissible as corroborative proof, and is drawn from a consideration of the *cui bono*? No such argument would for a moment stand against a single observed fact, and we have too many instances of this in the history of the subject to permit us to tread otherwise than warily on such dangerous ground. But after all we may surely ask, what is the use of this alleged obliquity? It is not only said to take place before the head is actually engaged in the brim, but, according to Naegele, is more marked then, and cannot therefore be due to any resistance from the hard parts of the pelvis. But, even if it did not occur till the head experience the resistance of the brim itself, it is difficult to conceive what mechanical advantage would result therefrom, as there is ample room and to spare in any well-formed pelvis for the biparietal measurement of a full-sized foetal cranium. In the case of the long diameter of the head, we are able, without any difficulty, to

assign a cause for the obliquity which causes the occiput to pass in advance of the forehead, but in this case I cannot imagine a single theory which will bear examination for a moment. I can understand how it may exceptionally occur, being rendered necessary by a deformed pelvis, a distended rectum, or some other cause, but I am perfectly convinced that the rule in the vast majority of cases is, that the head enters the pelvis *directly*, in—or nearly in—the axis of the pelvic brim.

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